

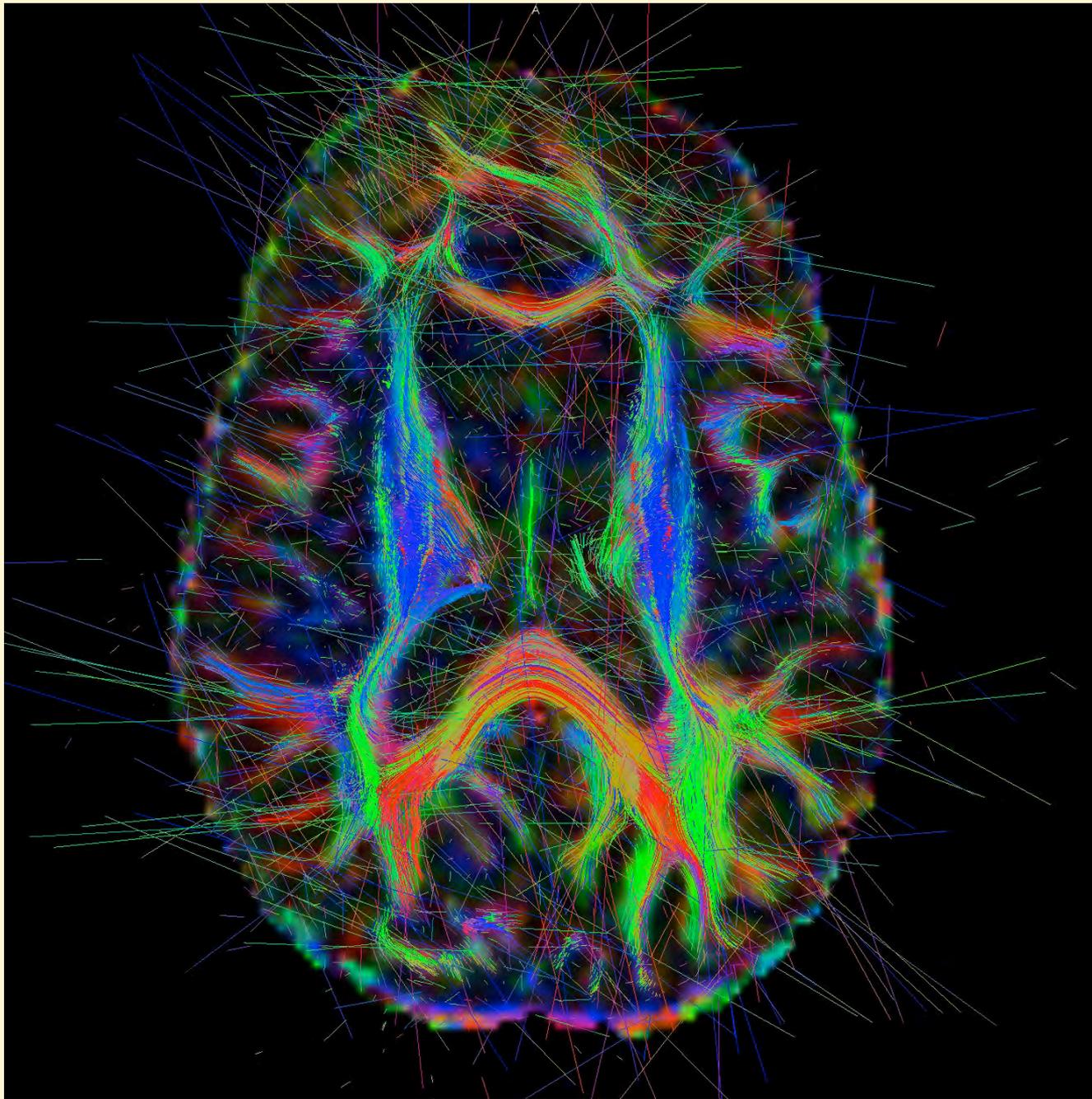
# THE PHYSIOLOGY OF ADDICTION

## *Effects of Drug-Taking Behavior on the Brain*

Ruth A. Potee, MD

Family Physician & Addictionologist, Valley Medical Group  
Medical Director, Franklin County House of Corrections  
Medical Director, Franklin Recovery Center  
Medical Director, Pioneer Valley Regional School District  
Co-Chair – Healthcare Solutions of the Opioid Taskforce

*Thanks to Tess Jurgensen and the OTF of Franklin County  
and North Quabbin for organizing these forums*



# HIJACKING THE BRAIN

New research suggests that the brain's reward system has different mechanisms for craving and pleasure. Craving is driven by the neurotransmitter dopamine. Pleasure is stimulated by other neurotransmitters in "hedonic hot spots." When the craving circuitry overwhelms the pleasure hot spots, addiction occurs, leading people to pursue a behavior or drug despite the consequences.

## PATHWAYS TO CRAVING

Desire is triggered when dopamine, which originates near the top of the brain stem, travels through neural pathways to act on the brain. Drugs increase the flow of dopamine.

### Ventral tegmental area (VTA)

Dopamine is produced here and flows outward along neurons distributed throughout the brain's reward system.

### Dorsal striatum

Neurons here help form habits by identifying enjoyable patterns, such as the anticipation of buying drugs.

### Prefrontal cortex

The amino acid glutamate, produced here, interacts with dopamine to spark visualizations that cue cravings.

### Amygdala

Neurons here are stimulated by learned emotional responses, such as memories of cravings and pleasure.

### Orbitofrontal cortex

This hot spot gives a sense of gratification but is also the first to shut down if a person has indulged too much.

### Ventral pallidum

Animal experiments show that damaging this hot spot can turn something that once gave pleasure into a source of disgust.

### Nucleus accumbens

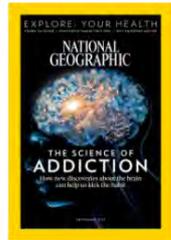
A hot spot within this key part of the craving circuitry amplifies the response to pleasure.

## PLEASURE HOT SPOTS

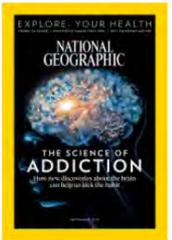
A system of small hedonic hot spots, unrelated to dopamine, provides temporary sensations of pleasure and forms a feedback loop with the reward system that controls desire.

### Brain stem

Basic visceral sensations and reactions to pleasure, such as smiling, originate from this hot spot.



September 2017



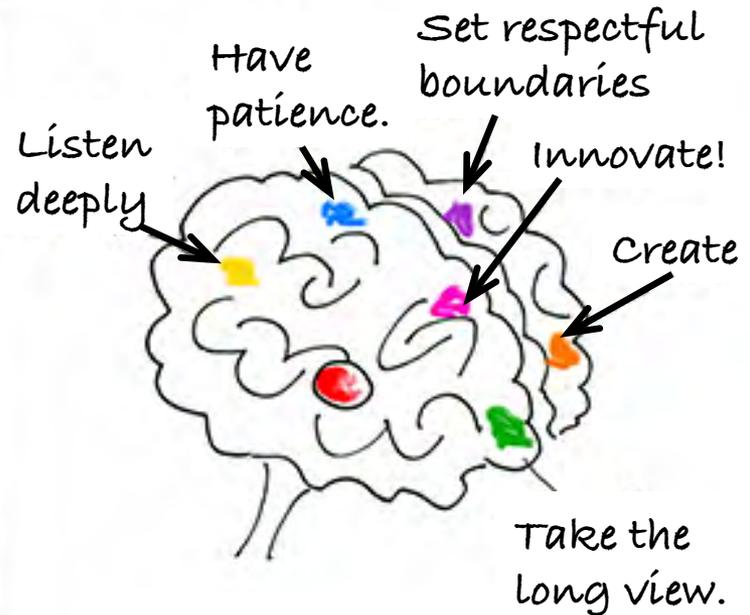
September 2017

# EAT, DRINK, HAVE SEX (AND USE DRUGS)



Run!  
Fight!  
Get Laid!

Lizard brain advice



Listen deeply

Have patience.

Set respectful boundaries

Innovate!

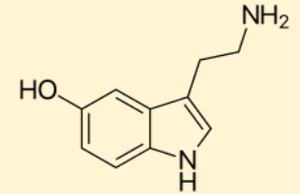
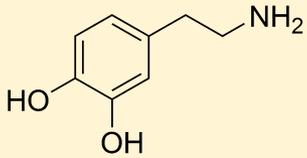
Create

Take the long view.

Cortex advice

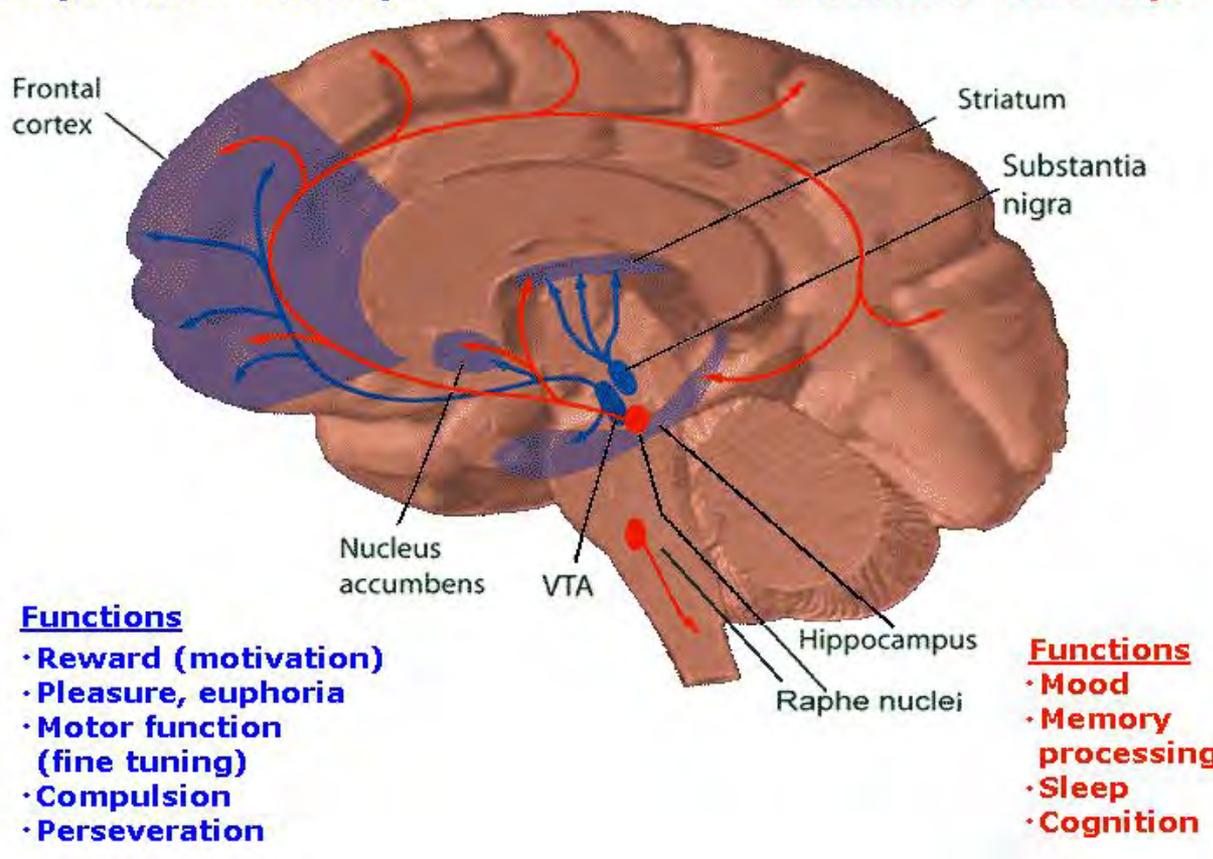
# DOPAMINE & SEROTONIN

## Location and Function



### Dopamine Pathways

### Serotonin Pathways

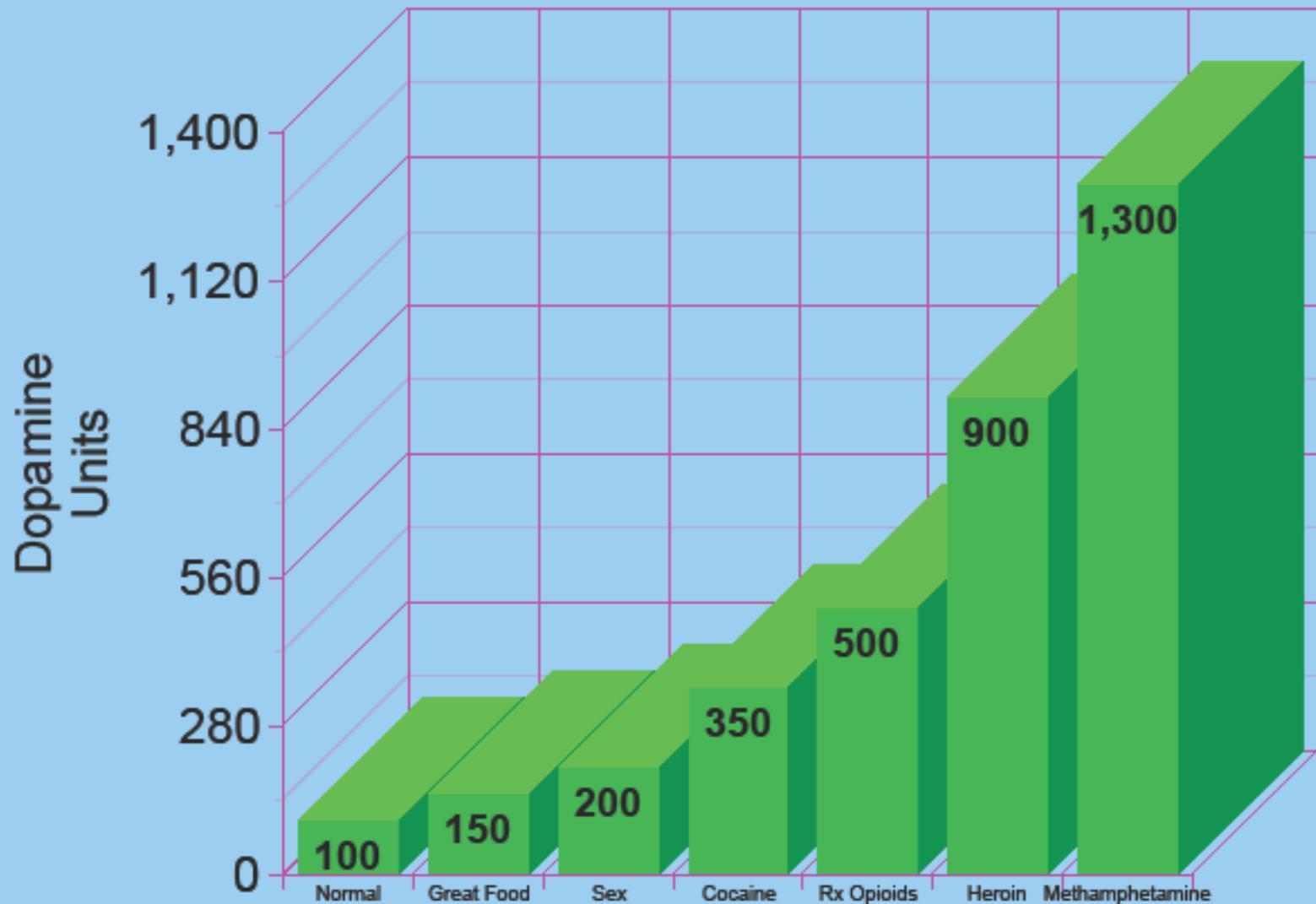




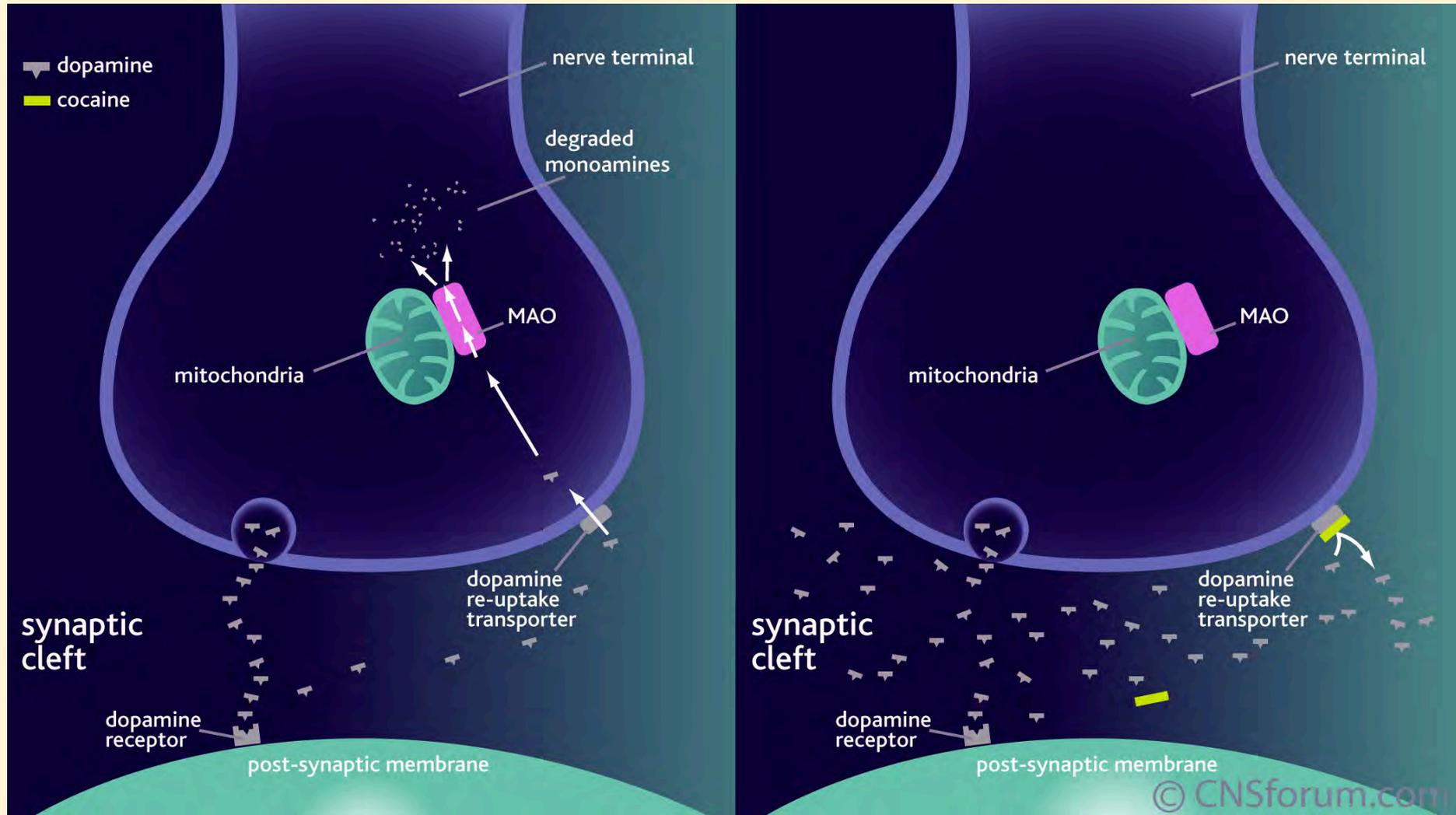
IT IS SAD  
TODAY.



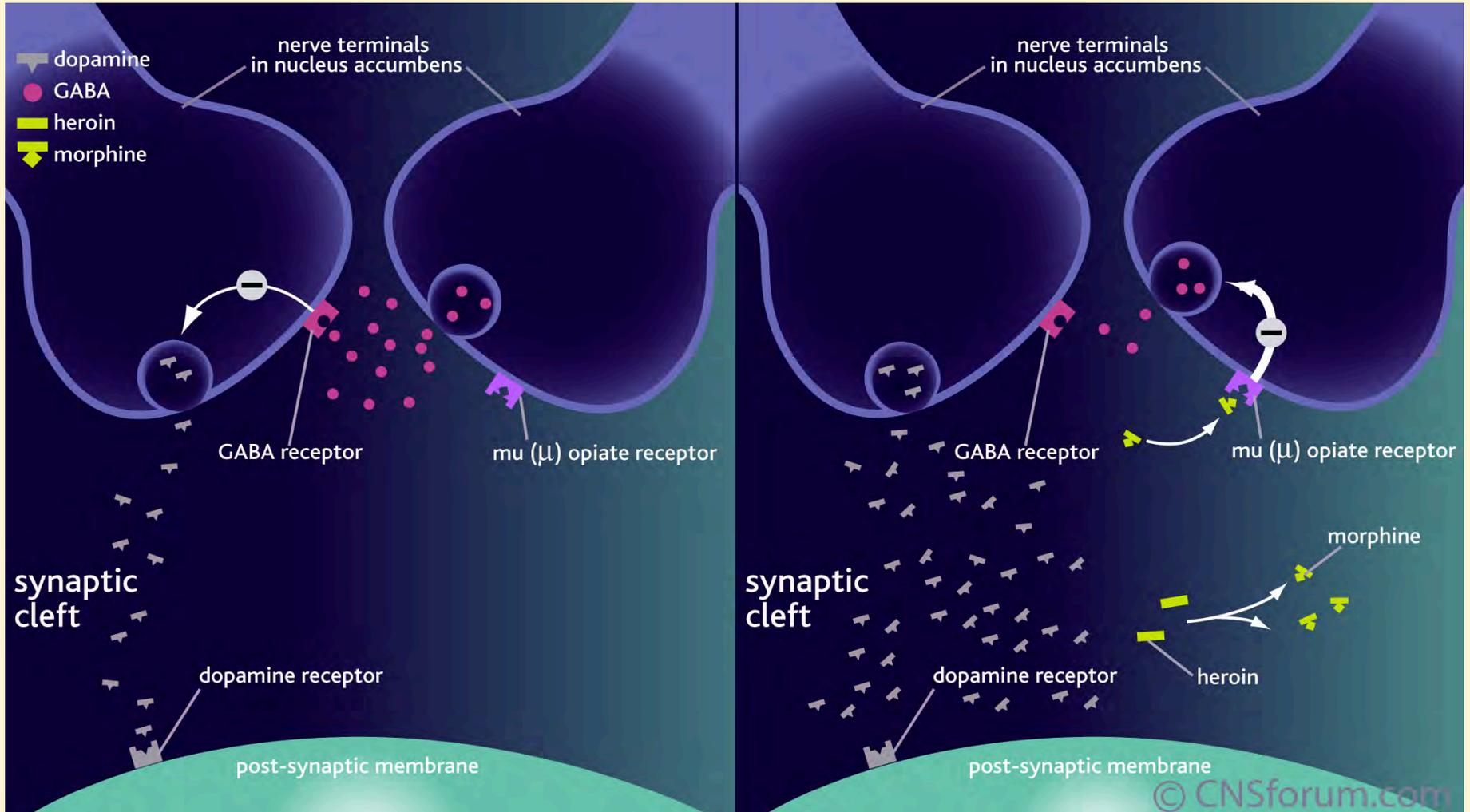
## Dopamine Levels

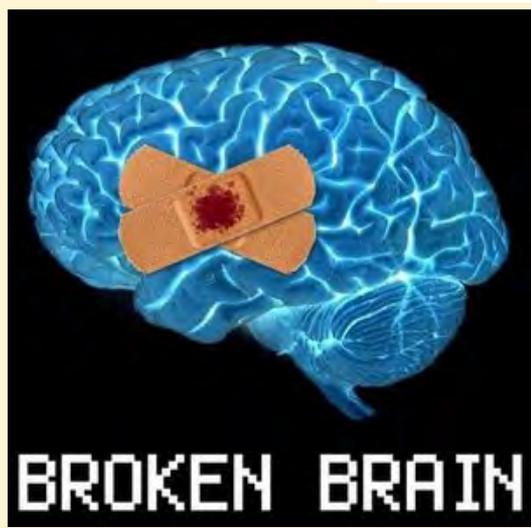
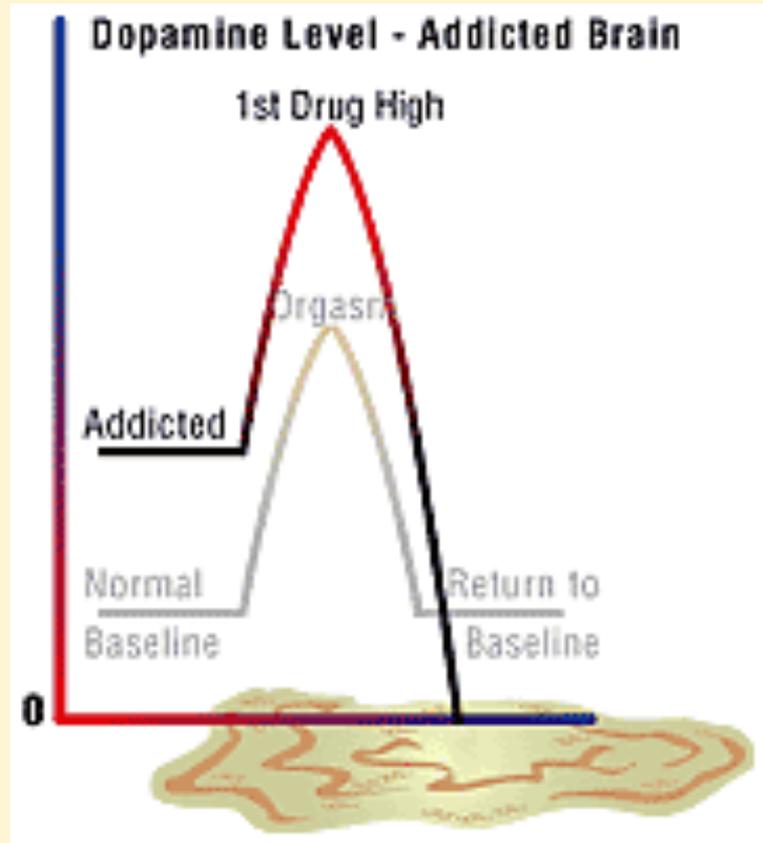
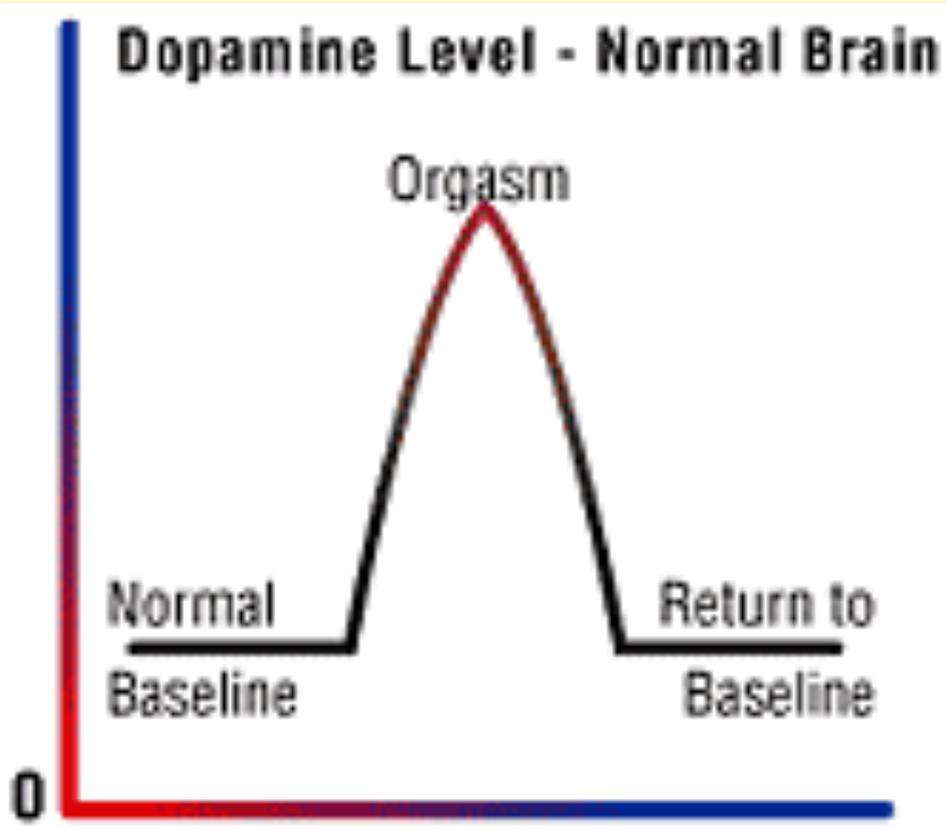


# How Cocaine Works

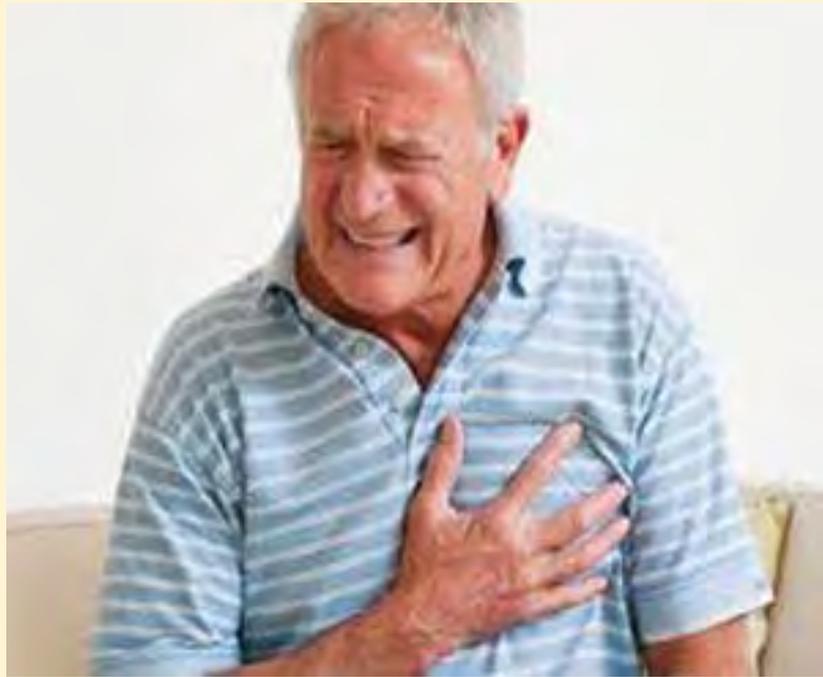


# How Heroin Works



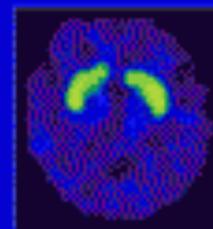
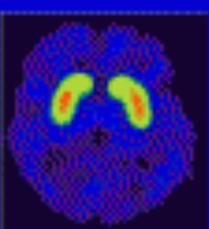
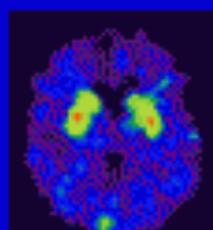
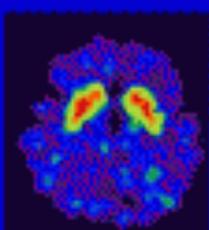
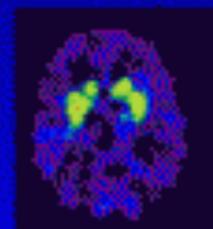
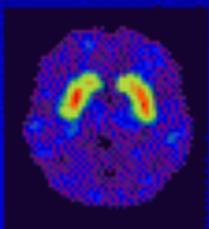
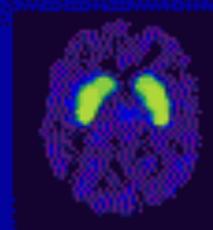
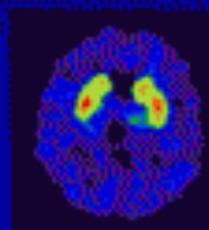


**BROKEN BRAIN**



# Functionally...

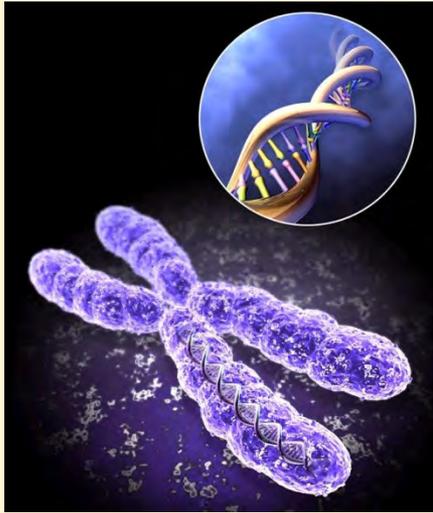
## Dopamine D2 Receptors are Decreased by Addiction



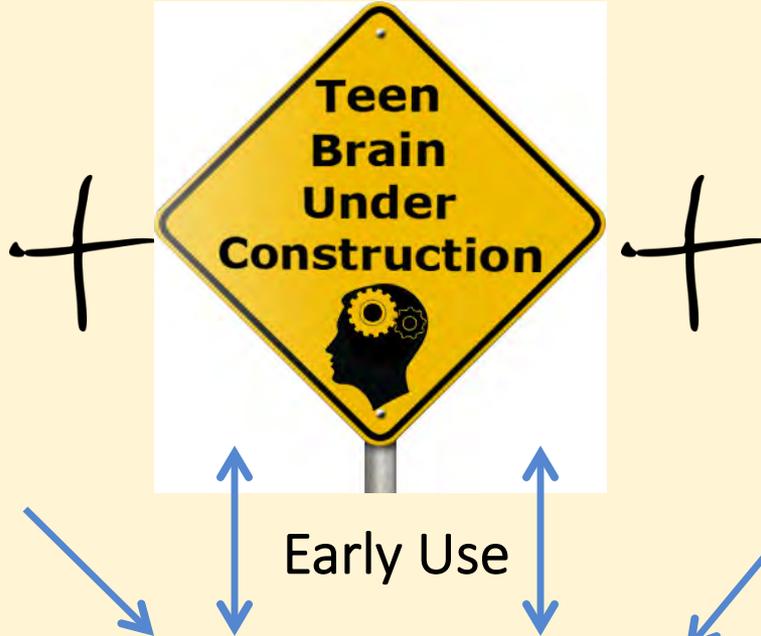
Control

Addicted





Genetics



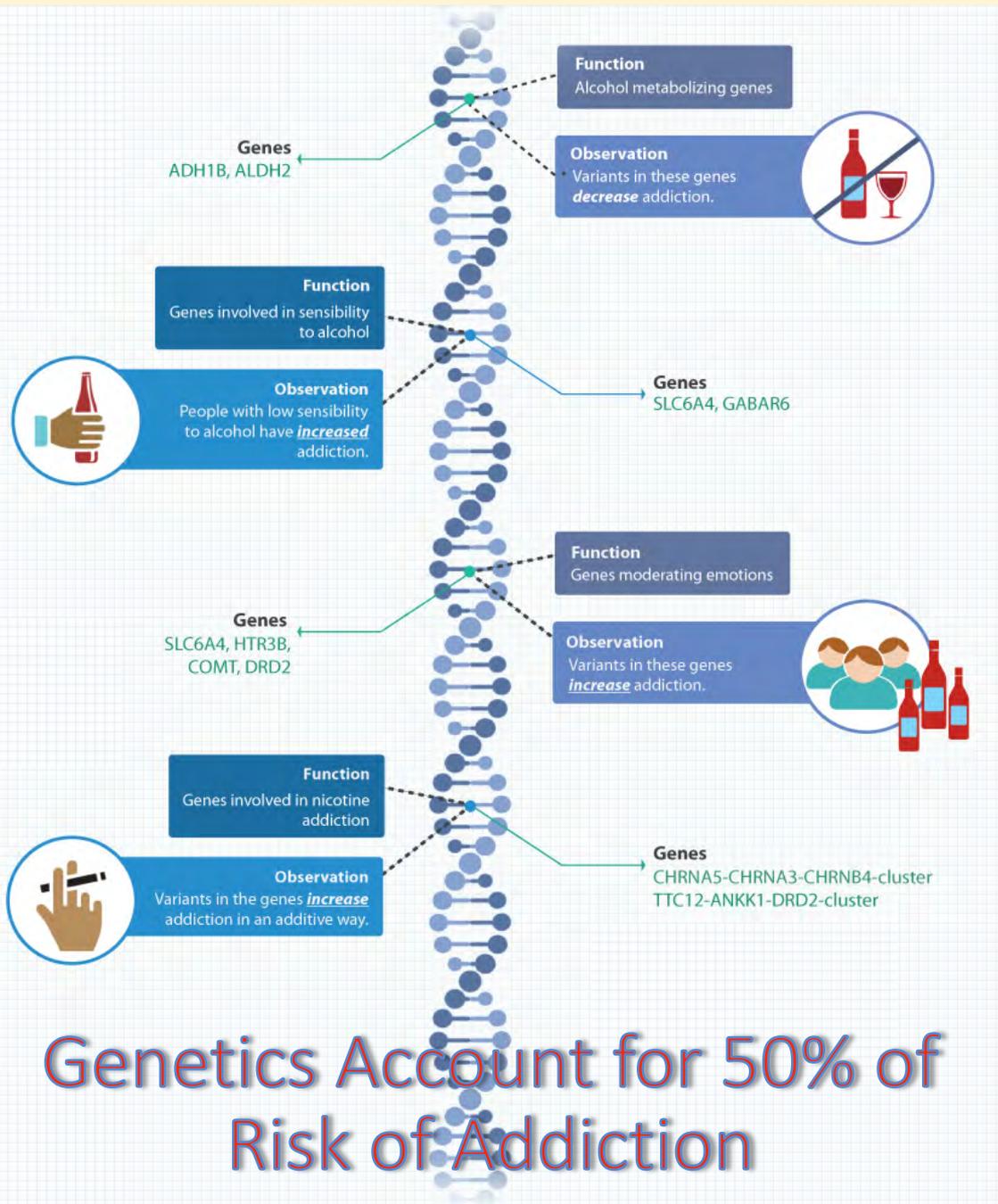
Early Use



Trauma



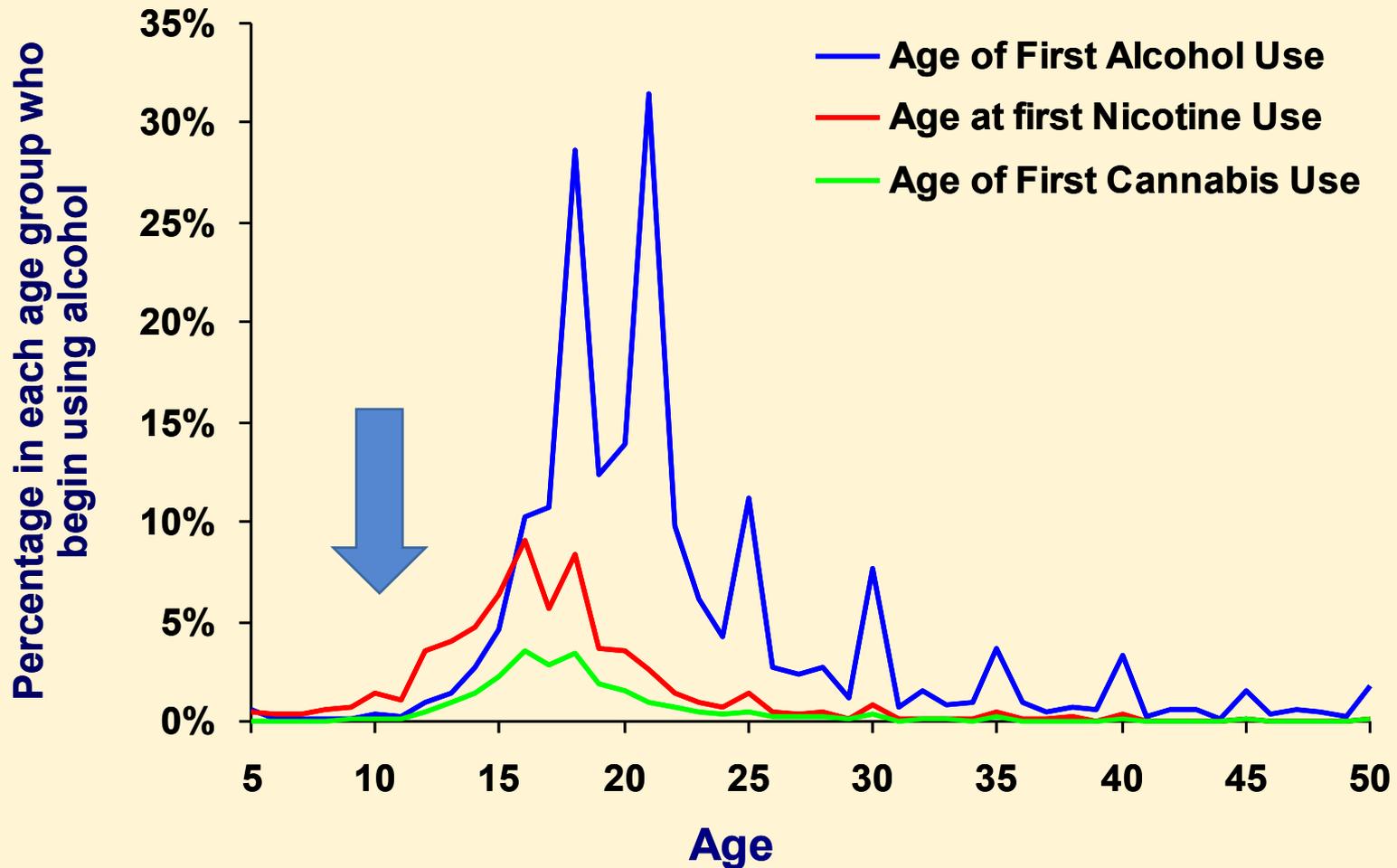
Poor Mental Health



Genetics Account for 50% of Risk of Addiction

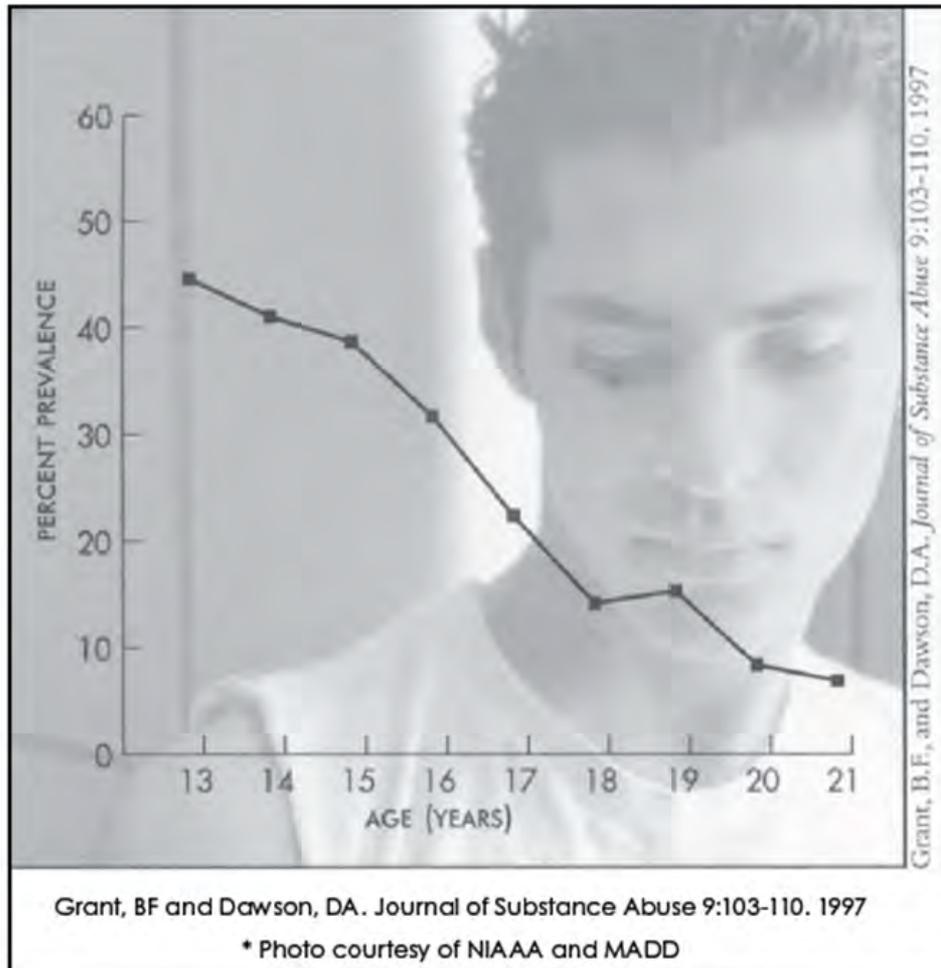


# Addiction is a Developmental Pediatric Disease



Source: NIAAA National Epidemiologic Survey on Alcohol and Related Conditions, 2003

# Teen Alcohol Use Wires The Brain For Addiction

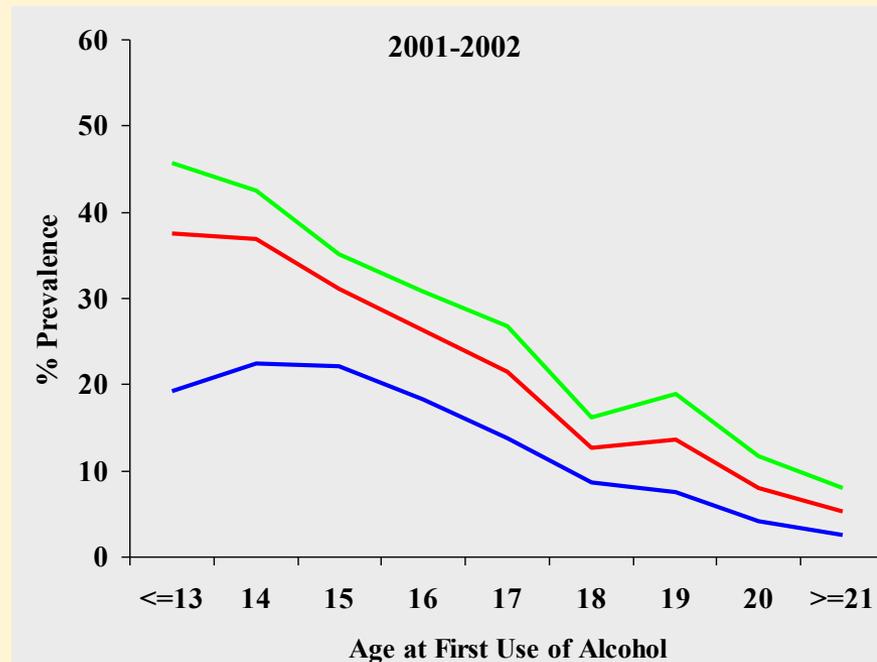


**40% of kids who begin drinking at age 15 will become alcoholics.**

**Only 7% of those who begin drinking at age 21 become alcoholics.**



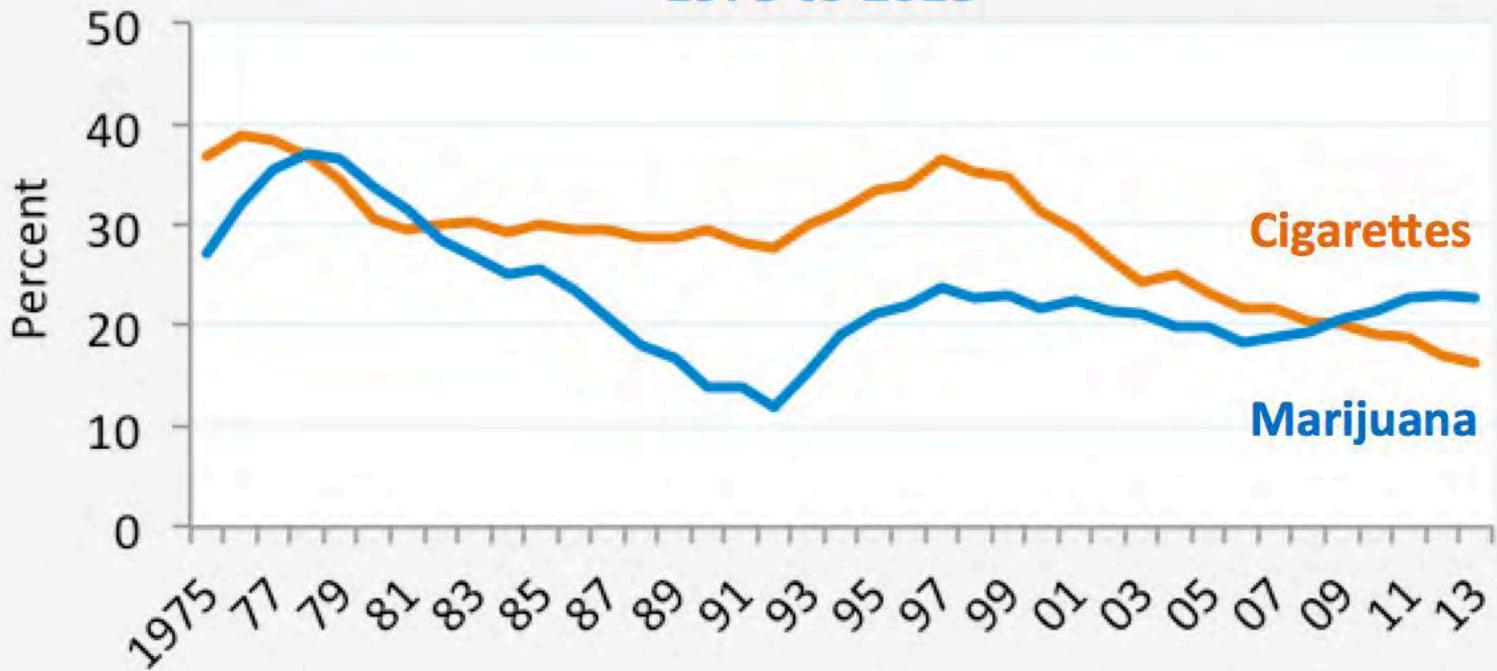
# Prevalence of Lifetime Alcohol Dependence by Age of First Alcohol Use and Family History of Alcoholism



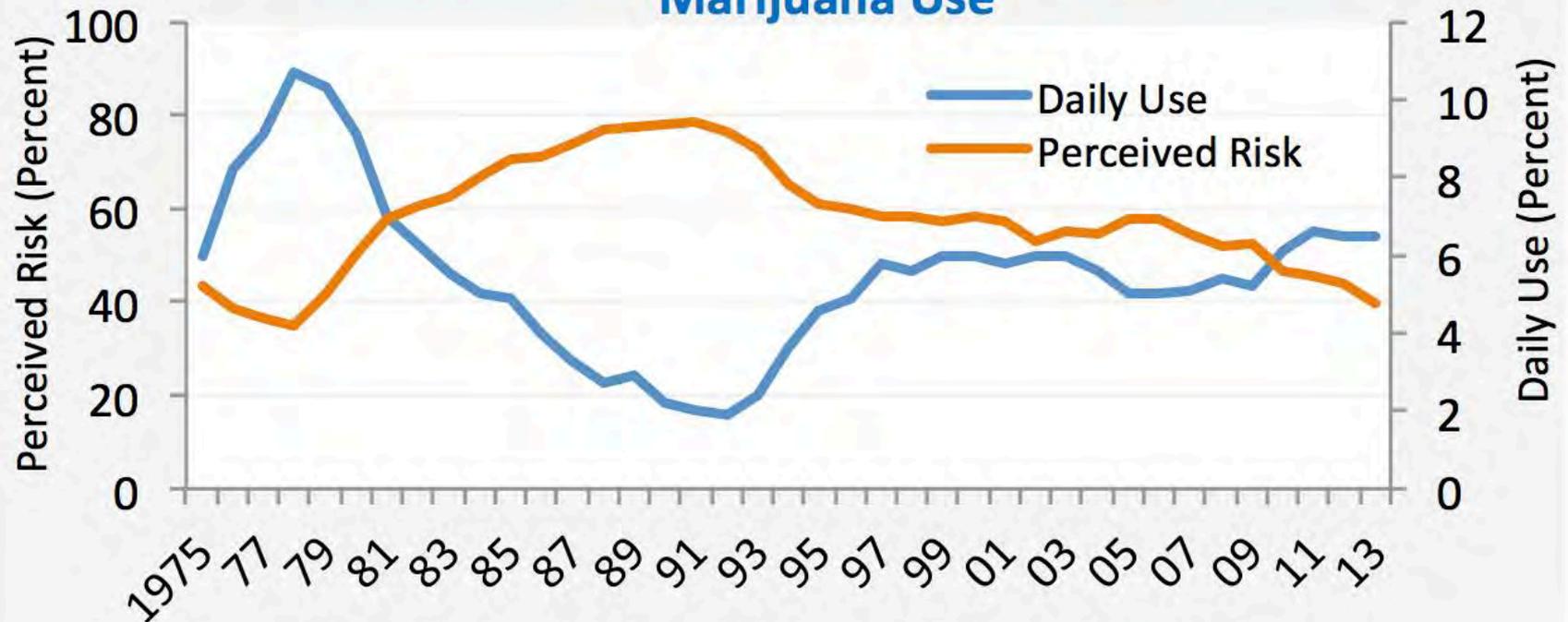
Source: 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions; Laboratory of Epidemiology and Biometry; DICBR, NIAAA, Bethesda, MD.

- Parental History Positive
- Total
- Parental History Negative

### Percentage of U.S. 12th Grade Students Reporting Past Month Use of Cigarettes and Marijuana, 1975 to 2013



## Percentage of U.S. 12 Grade Students Reporting Daily Marijuana Use vs. Perceived Risk of Regular Marijuana Use



Source: The Monitoring the Future study, the University of Michigan



“Not Addictive”

“It’s Natural”

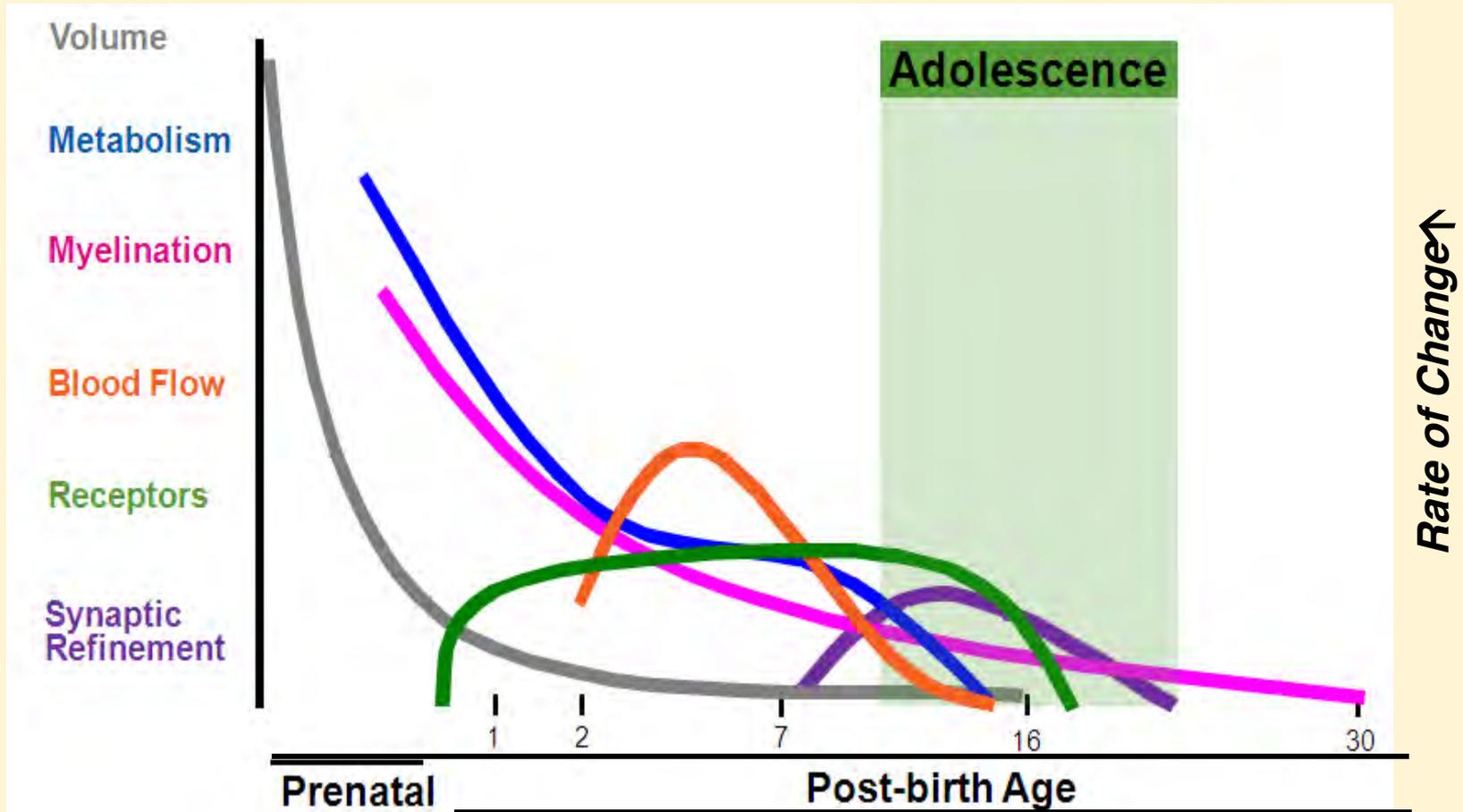
“It’s Medicine”

“Better than  
Alcohol”

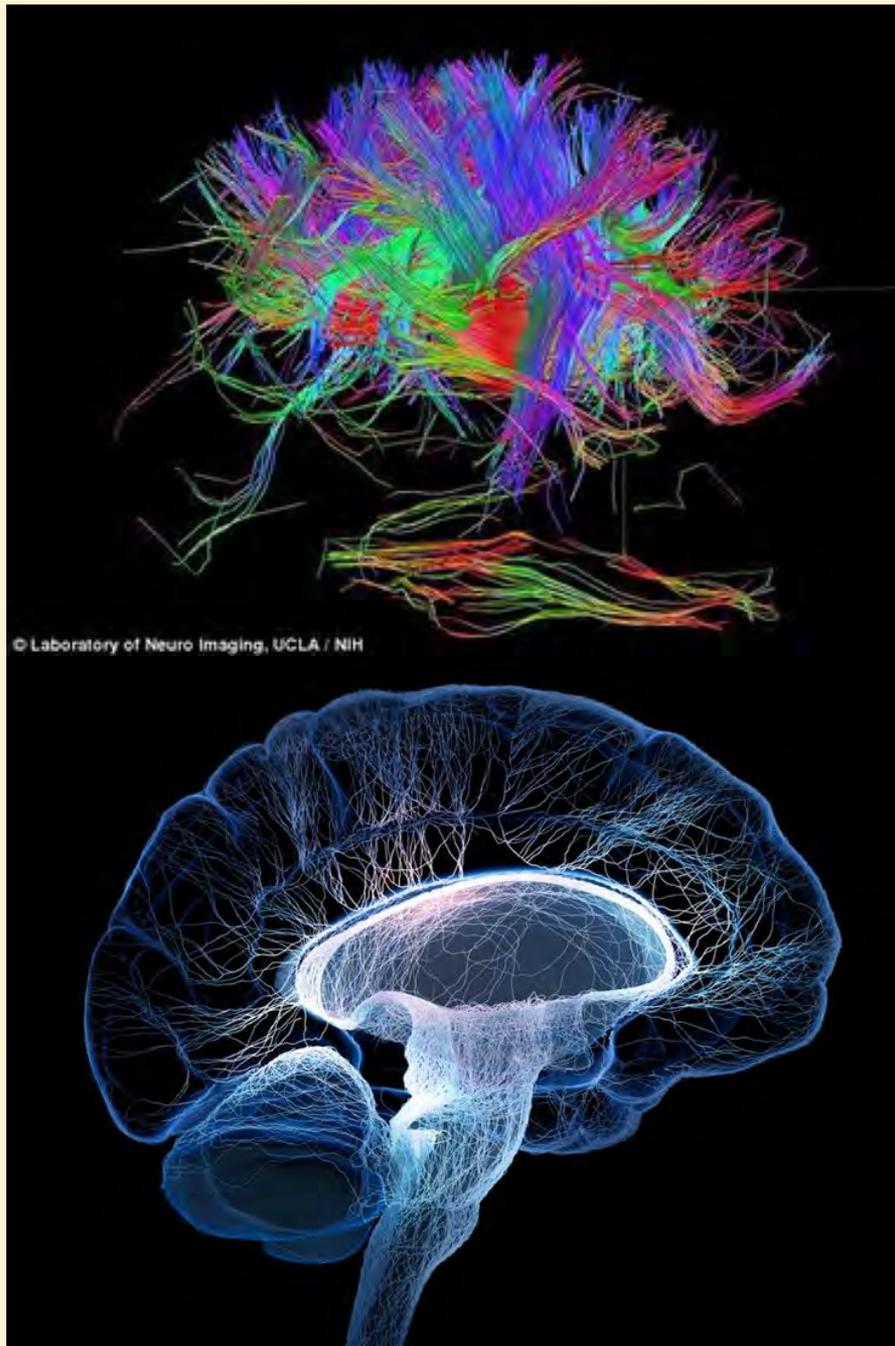
“It is Legal”

“Never Killed  
Anyone”

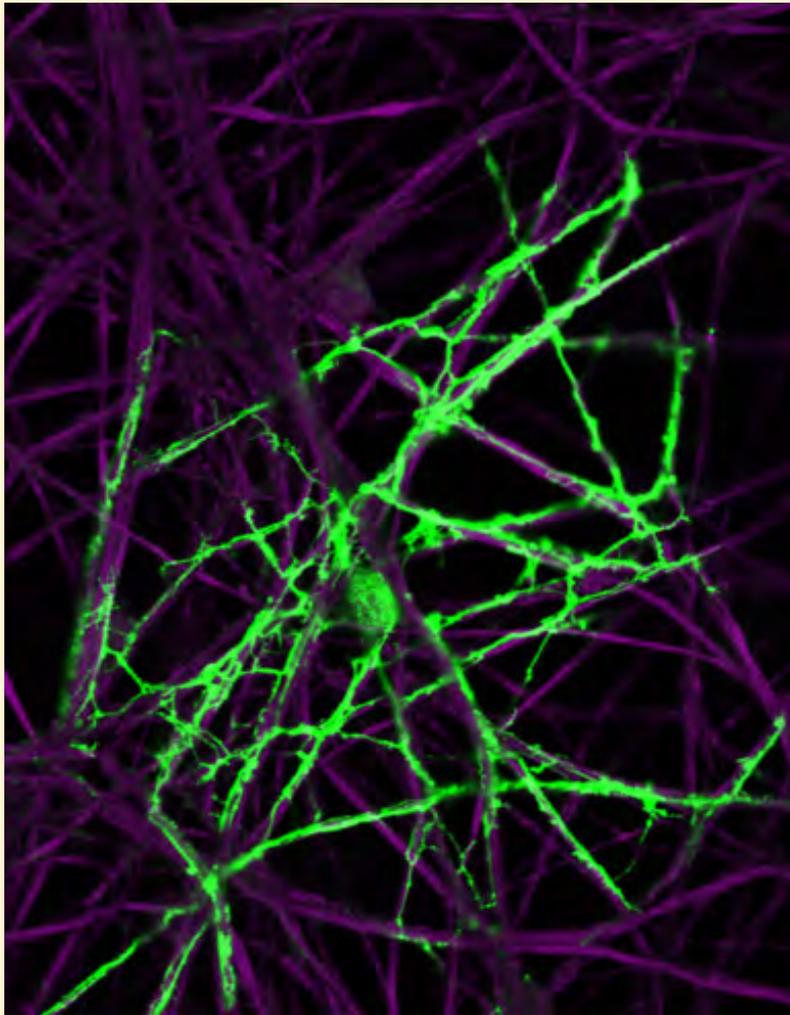
# Brain Development



Source: Tapert & Schweinsburg, 2005



# Synaptic Refinement



Myelination

# This is Normal Development

Hypersensitive  
to Social  
Exclusion

Preference for  
Physical  
Activity and  
Sensation  
Seeking

More Risky  
Impulsive  
Behavior

Emotions Felt  
Very  
Intensely



Less than  
Optimal  
Planning

Less  
Consideration  
of Negative  
Consequences

Strongly  
Influenced by  
Friends and  
Peers

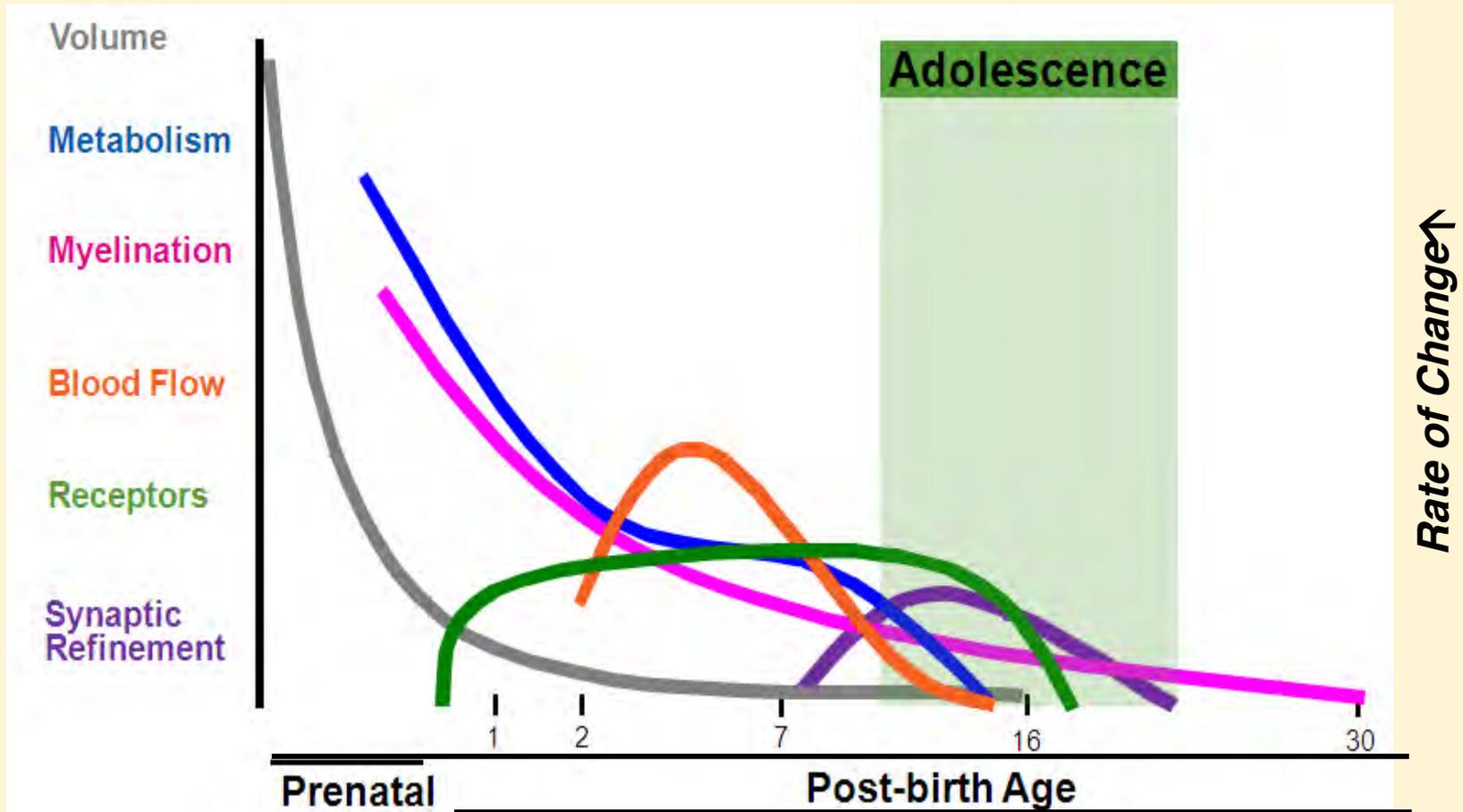
“I’M NOT  
WHO YOU THINK I AM;  
I’M NOT  
WHO I THINK I AM.  
I AM  
WHO I THINK  
YOU THINK I AM.”

~ THOMAS COOLEY

#### The Looking Glass Self

Adolescents are more likely to compare themselves to others, feel that they are being compared or judged and place higher value on that judgement

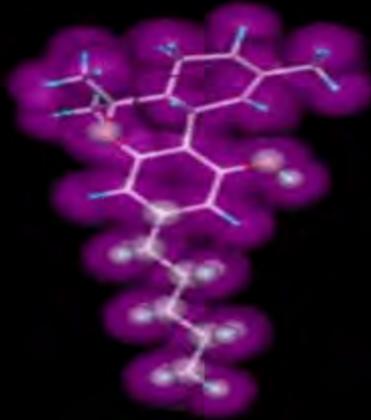
# Brain Development



Source: Tapert & Schweinsburg, 2005

Marijuana  
(Tetrahydrocannabinol)

**Drug**



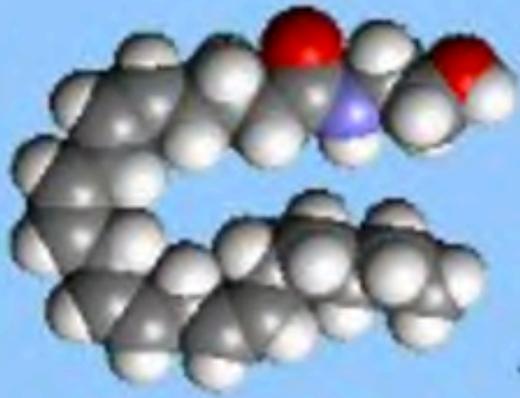
**THC**

Endo-cannabinoid  
(Anandamide)

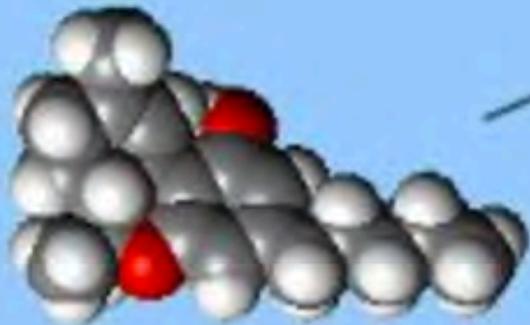
**Brain's Chemical**



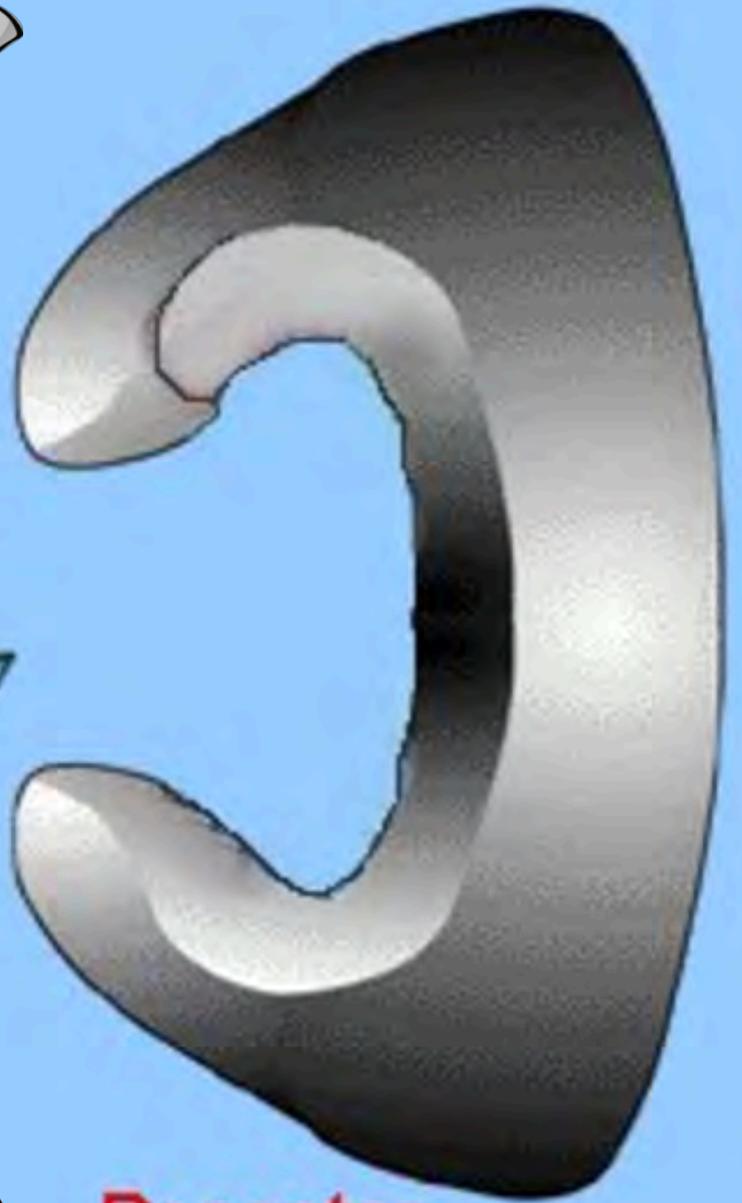
**Anandamide**



**anandamide**



**THC**



**Receptor**

# Persistent cannabis users show neuropsychological decline from childhood to midlife

Madeline H. Meier<sup>a,b,1</sup>, Avshalom Caspi<sup>a,b,c,d,e</sup>, Antony Ambler<sup>e,f</sup>, HonaLee Harrington<sup>b,c,d</sup>,  
Renate Houts<sup>b,c,d</sup>, Richard S. E. Keefe<sup>d</sup>, Kay McDonald<sup>f</sup>, Aimee Ward<sup>f</sup>, Richie Poulton<sup>f</sup>, and  
Terrie E. Moffitt<sup>a,b,c,d,e</sup>

Author Affiliations 

Edited by Michael I. Posner, University of Oregon, Eugene, OR, and approved July 30, 2012 (received for review April 23, 2012)

Abstract

Full Text

Authors & Info

Figures

SI

Metrics

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## Abstract

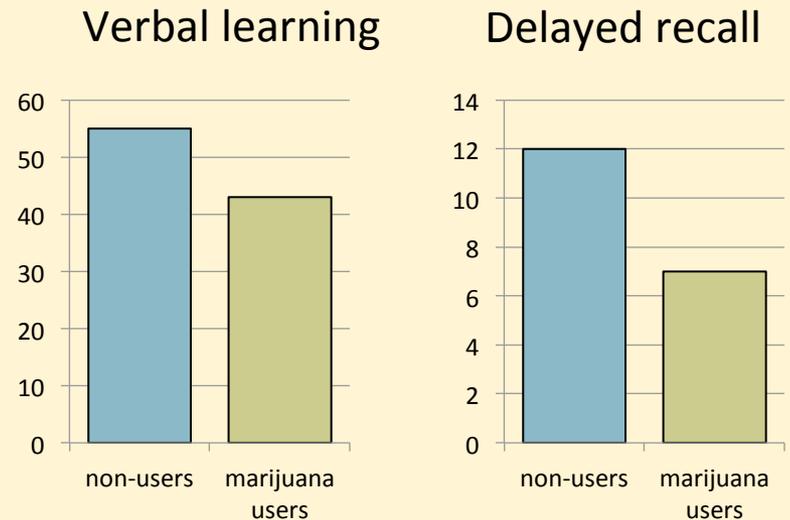
Recent reports show that fewer adolescents believe that regular cannabis use is harmful to health. Concomitantly, adolescents are initiating cannabis use at younger ages, and more adolescents are using cannabis on a daily basis. The purpose of the present study was to test the association between persistent cannabis use and neuropsychological decline and determine whether decline is concentrated among adolescent-onset cannabis users. Participants were members of the Dunedin Study, a prospective study of a birth cohort of 1,037 individuals followed from birth (1972/1973) to age 38 y. Cannabis use was ascertained in interviews at ages 18, 21, 26, 32, and 38 y. Neuropsychological testing was conducted at age 13 y, before initiation of cannabis use, and again at age 38 y, after a pattern of persistent cannabis use had developed. Persistent cannabis use was associated with neuropsychological decline broadly across domains of functioning, even after controlling for years of education. Informants also reported noticing more cognitive problems for persistent cannabis users. Impairment was concentrated among adolescent-onset cannabis users, with more persistent use associated with greater decline. Further, cessation of cannabis use did not fully restore neuropsychological functioning among adolescent-onset cannabis users. Findings are suggestive of a neurotoxic effect of cannabis on the adolescent brain and highlight the importance of prevention and policy efforts targeting adolescents.

# Deficits in Cognitive Functioning Among Active Marijuana Users

Many studies show that adolescents who use marijuana heavily tend to score worse than non-users on tests of:

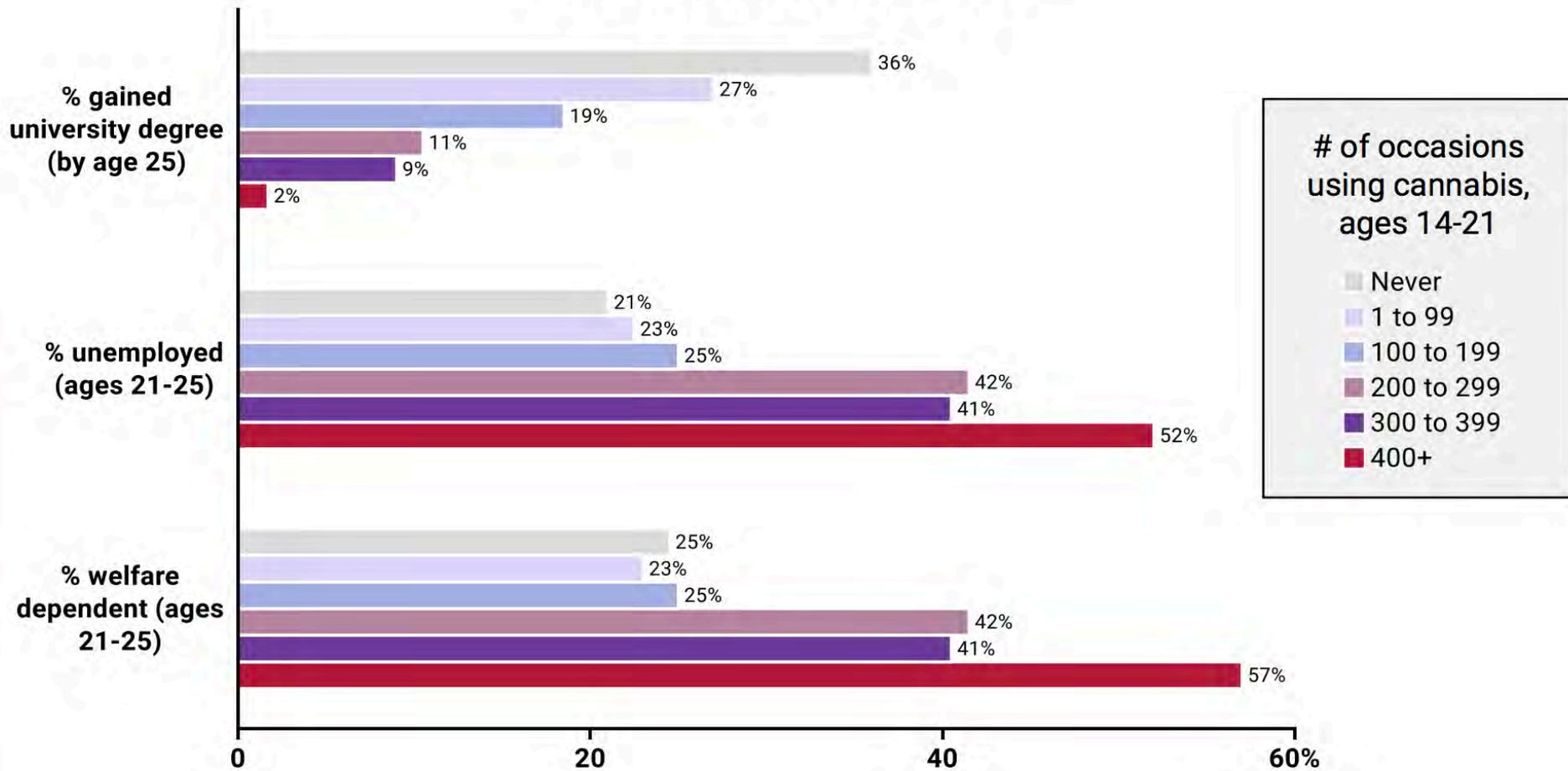
- attention
- verbal learning
- memory
- processing speed

... even when they are not high.



Messinis, et al 2006

# New Zealand study showing relationship between cannabis use and social outcomes



Source: Fergusson and Boden. *Addiction*, 103, pp. 969-976, 2008 [New Zealand study]

# Loss of Adult IQ with Marijuana Dependence in Adolescence

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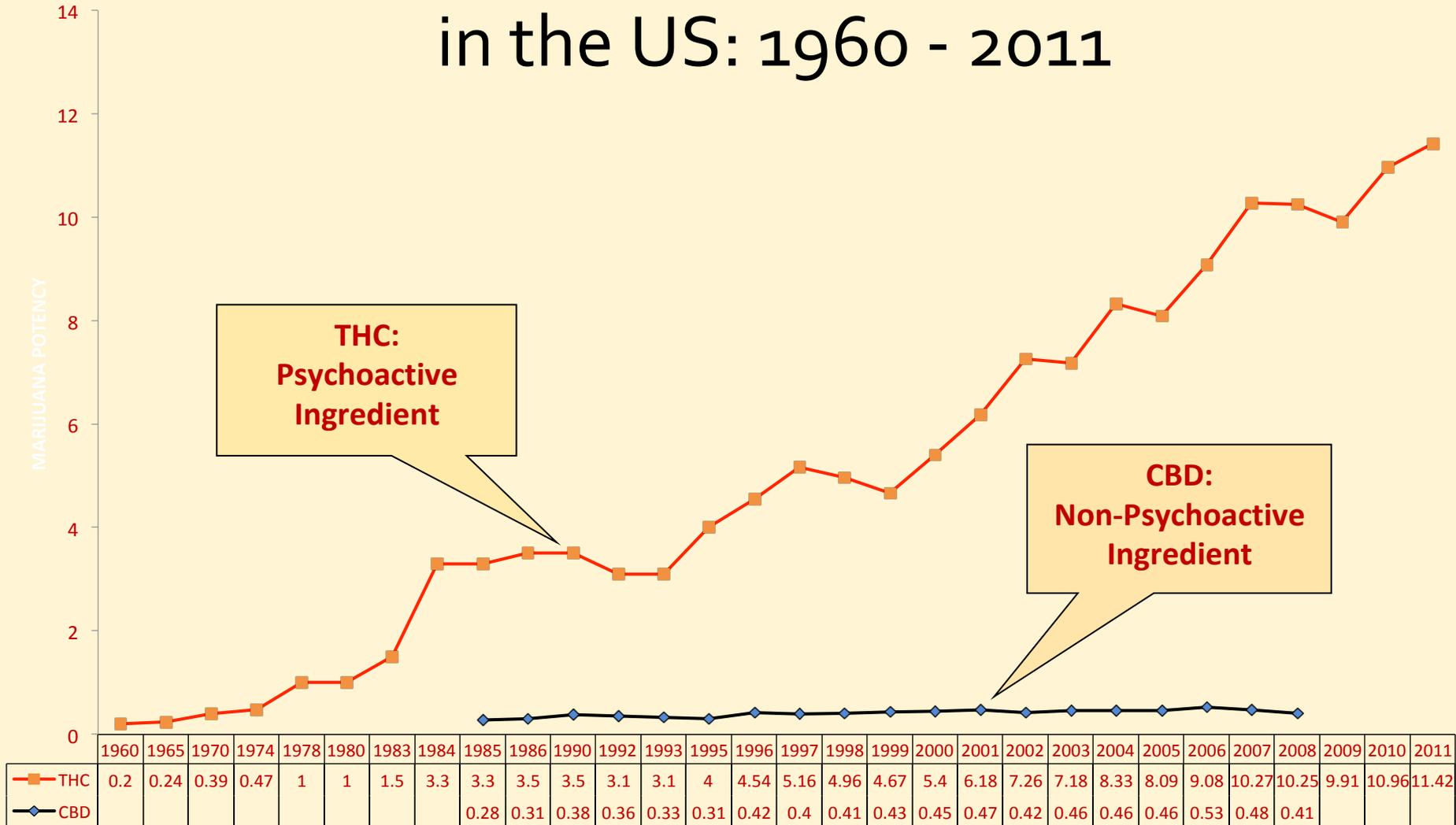
## Findings:

- **Those who developed marijuana dependence before age 18 showed IQ decline in adulthood.**
- The longer their dependence persisted, the greater the decline, with a decline of 8 IQ points for the most persistent users.
- **Those who began using in adulthood did not show IQ decline.**
- Quitting in adulthood did not restore functioning in those who began in adolescence.

### **Persistent cannabis users show neuropsychological decline from childhood to midlife**

Madeline H. Meier, Avshalom Caspi, Antony Ambler, HonaLee Harrington, Renate Houts, Richard S. E. Keefe, Kay McDonald, Aimee Ward, Richie Poulton, and Terrie E. Moffitt  
PNAS October 2, 2012. 109 (40) E2657-E2664

# Average THC & CBD levels in the US: 1960 - 2011



Data from the NIDA-sponsored Potency Monitoring program at the University of Mississippi, showing average THC and CBD levels in samples of marijuana seized by federal, state and local governments in each year shown.

# THC Concentrates



*"Green Crack" wax*



*"Ear Wax"*



Butane Hash Oil (BHO)



Hash Oil Capsules



*"Budder"*

*"Shatter"*



## SMOKING



PIPE



BONG



BUBBLER



DAB



JOINT



BLUNT

## BEVERAGES



TEA



SODA



ALCOHOL



MILK

## EDIBLES



CANDY



ICE CREAM



BAKED GOODS

## VAPORIZING



DESKTOP VAPORIZER



PORTABLE VAPORIZER

## OTHER



CAPSULES



SPRAY



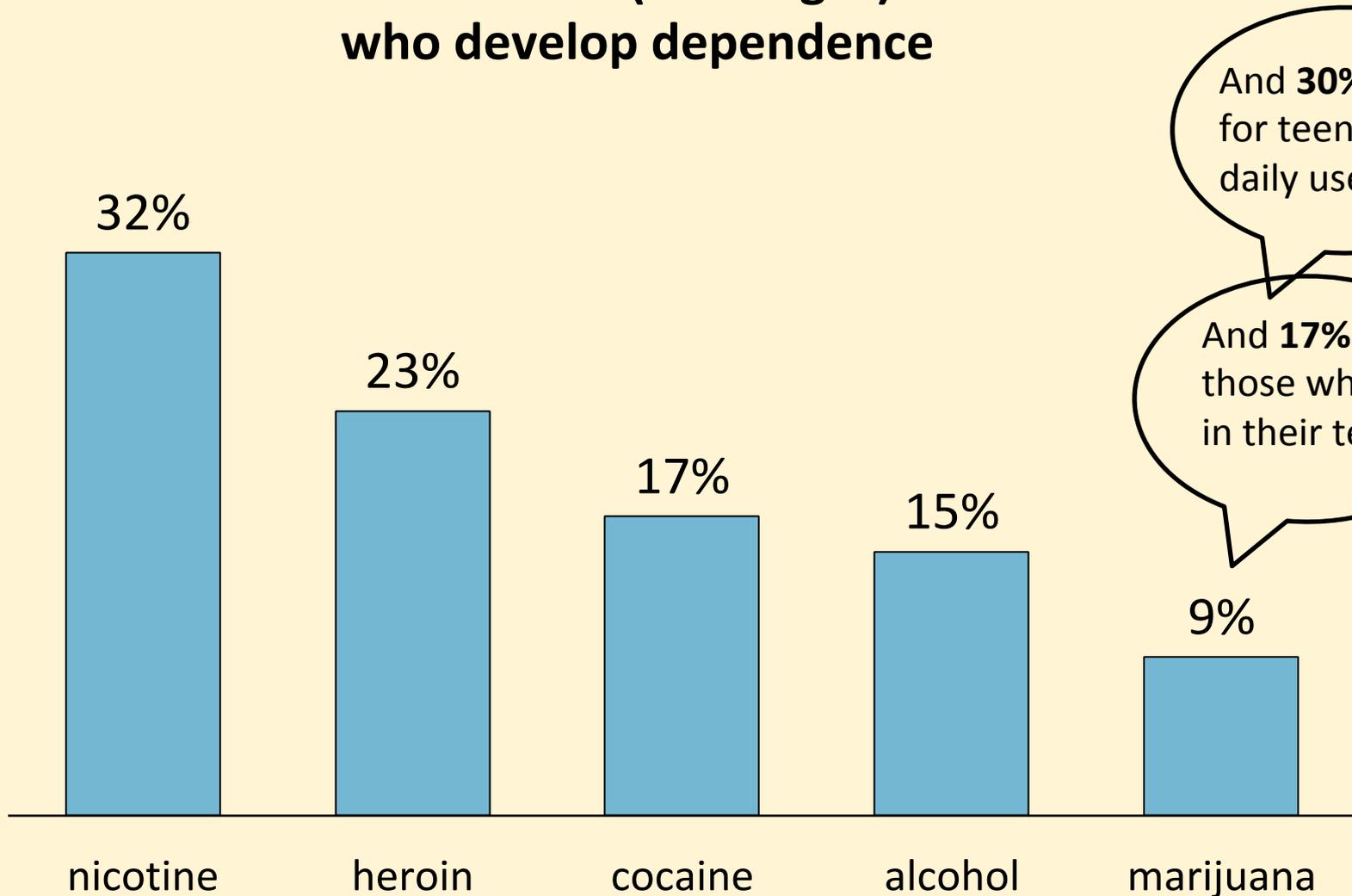
TINCTURE

Ways to  
consume  
marijuana

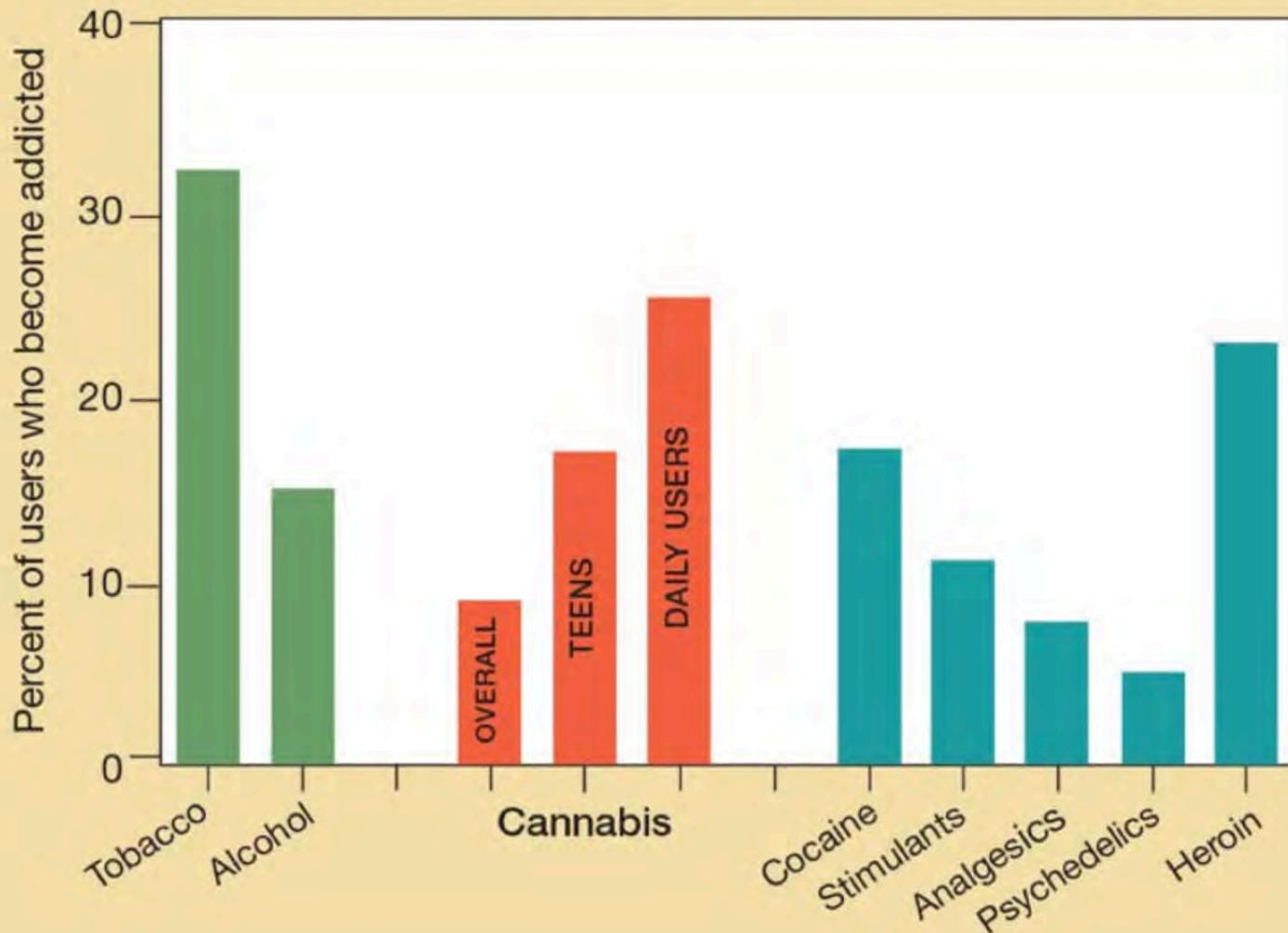


# Is Marijuana Addictive?

% of users (of all ages)  
who develop dependence



## Comparison of addictive potential by drug type<sup>19</sup>



Gilman, 2015--<http://www.psychiatrictimes.com/special-reports/cannabis-use-young-adults-challenges-during-transition-adulthood>

# Big Marijuana — Lessons from Big Tobacco

Kimber P. Richter, Ph.D., M.P.H., and Sharon Levy, M.D., M.P.H.

The United States is divided over the legalization of marijuana. Arguments in favor include protection of individual rights, elimination of criminal sentencing for minor offenses, collection of tax revenue, and elimination of the black market. Counterarguments include the

N ENGL J MED 371:5 NEJM.ORG JULY 31, 2014

399

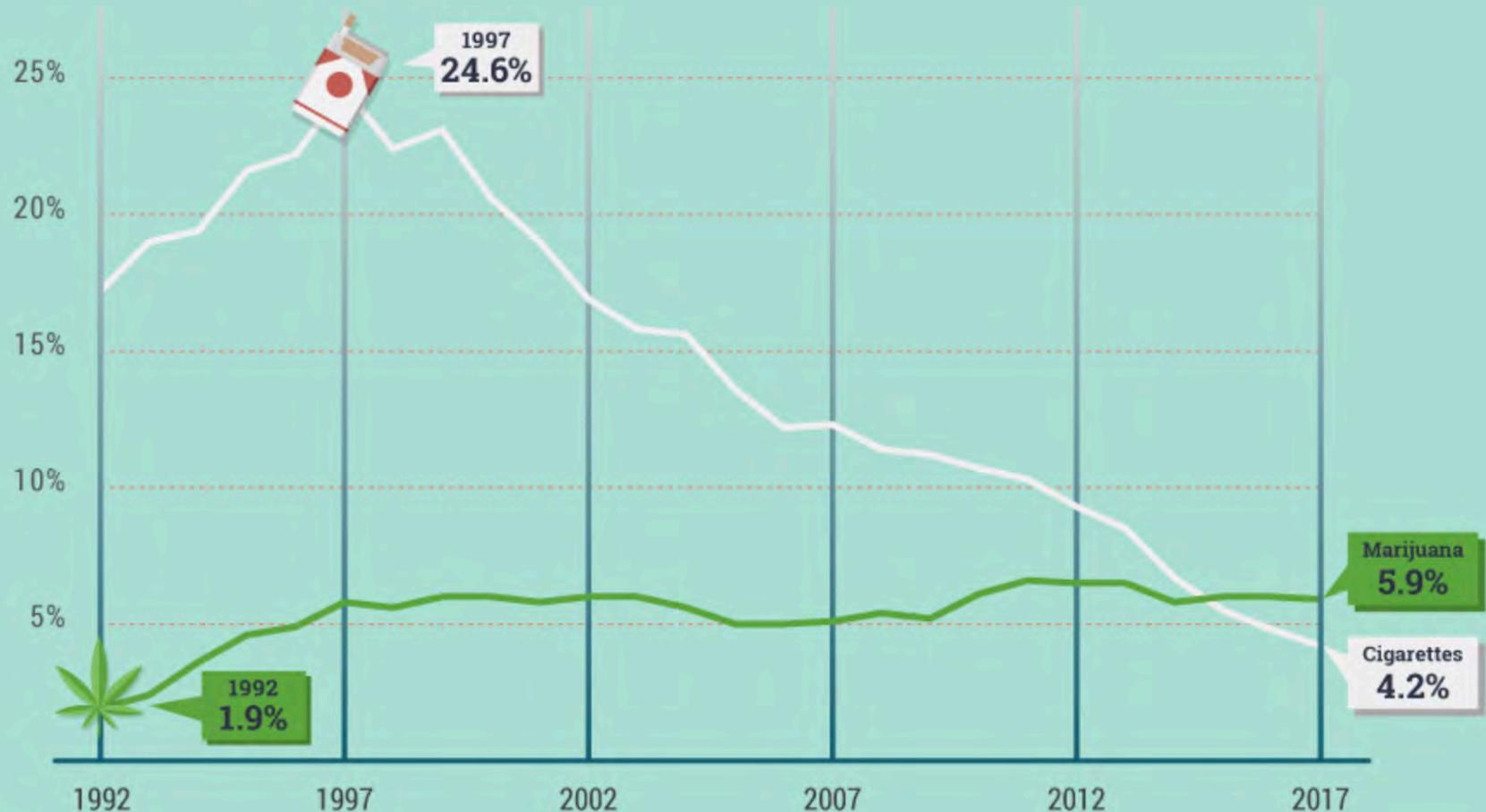
The New England Journal of Medicine

It took the medical and public health communities 50 years, millions of lives, and billions of dollars to identify the wake of illness and death left by legal, industrialized cigarettes. The free-market approach to tobacco clearly failed to protect the public's welfare and the common good: in spite of recent federal regulation, tobacco use remains the leading cause of death in the United States.

History and current evidence suggest that simply legalizing marijuana, and giving free rein to the resulting industry, is not the answer. To do so would be to once again entrust private industry with safeguarding the health of the public — a role that it is not designed to handle.

# TEENS MORE LIKELY TO USE MARIJUANA THAN CIGARETTES

## Daily use among 12th graders



National Institute  
on Drug Abuse

DRUGABUSE.GOV

# How Much Do Americans Drink?

There's a wide range.



Average number of drinks consumed per week

SOURCE: WASHINGTONPOST/WONKBLOG, "PAYING THE TAB" BY PHILIP J. COOK

**Low-risk drinking limits**

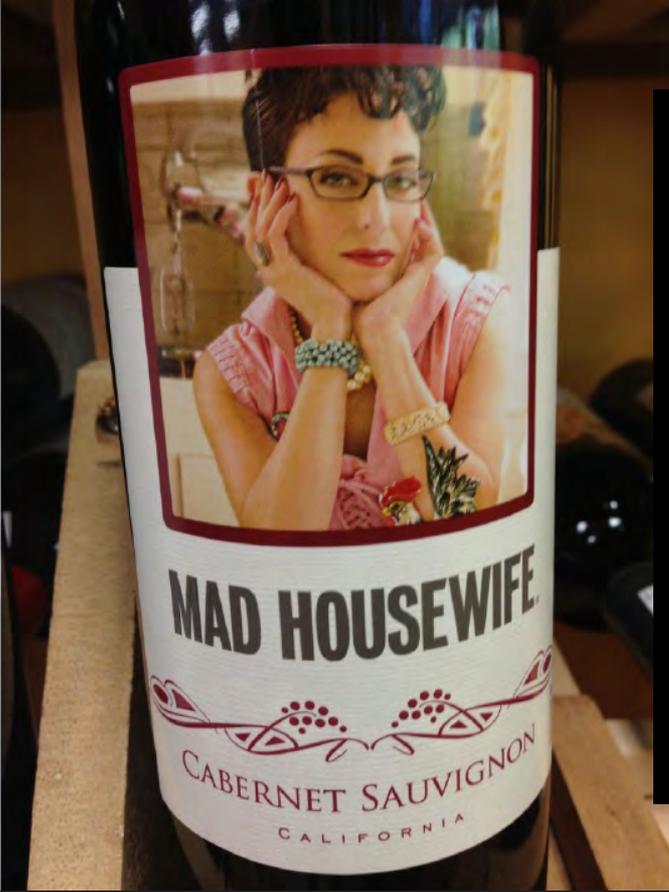


	MEN	WOMEN
<b>On any single DAY</b>	No more than <b>4</b>  drinks on any <b>day</b>	No more than <b>3</b>  drinks on any <b>day</b>
	**** <b>AND</b> ****	
<b>Per WEEK</b>	No more than <b>14</b>  drinks per <b>week</b>	No more than <b>7</b>  drinks per <b>week</b>

**To stay low risk, keep with BOTH the single-day AND weekly limits**

Infographic: NIAAA

<p><b>12 fl oz of regular beer</b></p>  <p>about 5% alcohol</p>	=	<p><b>8-9 fl oz of malt liquor (shown in a 12 oz glass)</b></p>  <p>about 7% alcohol</p>	=	<p><b>5 fl oz of table wine</b></p>  <p>about 12% alcohol</p>	=	<p><b>1.5 fl oz shot of 80-proof spirits ("hard liquor" — whiskey, gin, rum, vodka, tequila, etc.)</b></p>  <p>about 40% alcohol</p>
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# Association of parental supply of alcohol with adolescent drinking, alcohol-related harms, and alcohol use disorder symptoms: a prospective cohort study

*Richard P Mattick, Philip J Clare, Alexandra Aiken, Monika Wadolowski, Delyse Hutchinson, Jakob Najman, Tim Slade, Raimondo Bruno, Nyanda McBride, Kypros Kypri, Laura Vogl, Louisa Degenhardt*

**Interpretation** Providing alcohol to children is associated with alcohol-related harms. There is no evidence to support the view that parental supply protects from adverse drinking outcomes by providing alcohol to their child. Parents should be advised that this practice is associated with risk, both directly and indirectly through increased access to alcohol from other sources.

## Countries by their Alcohol Consumption

Rank	Country	Consumption Per Capita in Liters
1	Belarus	17.5
2	Moldova	16.8
3	Lithuania	15.4
4	Russian Federation	15.1
5	Romania	14.4
6	Ukraine	13.9
7	Andorra	13.8
8	Hungary	13.3
9	Czech Republic	13
10	Slovakia	13
11	Portugal	12.9
12	Serbia	12.8
13	South Korea	12.3
14	Finland	12.3
15	Latvia	12.3
16	Croatia	12.2
17	France	12.2
18	Australia	12.2
19	Luxembourg	11.9
20	Ireland	11.9
21	Germany	11.8
22	Denmark	11.4
23	Bulgaria	11.4
24	Belgium	11
25	South Africa	11



## Adverse Childhood Experiences – ACEs

*Emotional Neglect*  
*Abuse*  
*Household Dysfunction*

# Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults

## The Adverse Childhood Experiences (ACE) Study

Vincent J. Felitti, MD, FACP, Robert F. Anda, MD, MS, Dale Nordenberg, MD, David F. Williamson, MS, PhD, Alison M. Spitz, MS, MPH, Valerie Edwards, BA, Mary P. Koss, PhD, James S. Marks, MD, MPH

**Background:** The relationship of health risk behavior and disease in adulthood to the breadth of exposure to childhood emotional, physical, or sexual abuse, and household dysfunction during childhood has not previously been described.

**Methods:** A questionnaire about adverse childhood experiences was mailed to 13,494 adults who had completed a standardized medical evaluation at a large HMO; 9,508 (70.5%) responded. Seven categories of adverse childhood experiences were studied: psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. The number of categories of these adverse childhood experiences was then compared to measures of adult risk behavior, health status, and disease. Logistic regression was used to adjust for effects of demographic factors on the association between the cumulative number of categories of childhood exposures (range: 0–7) and risk factors for the leading causes of death in adult life.

**Results:** More than half of respondents reported at least one, and one-fourth reported  $\geq 2$  categories of childhood exposures. We found a graded relationship between the number of categories of childhood exposure and each of the adult health risk behaviors and diseases that were studied ( $P < .001$ ). Persons who had experienced four or more categories of childhood exposure, compared to those who had experienced none, had 4- to 12-fold increased health risks for alcoholism, drug abuse, depression, and suicide attempt; a 2- to 4-fold increase in smoking, poor self-rated health,  $\geq 50$  sexual intercourse partners, and sexually transmitted disease; and a 1.4- to 1.6-fold increase in physical inactivity and severe obesity. The number of categories of adverse childhood exposures showed a graded relationship to the presence of adult diseases including ischemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease. The seven categories of adverse childhood experiences were strongly interrelated and persons with multiple categories of childhood exposure were likely to have multiple health risk factors later in life.

**Conclusions:** We found a strong graded relationship between the breadth of exposure to abuse or household dysfunction during childhood and multiple risk factors for several of the leading causes of death in adults.

**Medical Subject Headings (MeSH):** child abuse, sexual, domestic violence, spouse abuse, children of impaired parents, substance abuse, alcoholism, smoking, obesity, physical activity, depression, suicide, sexual behavior, sexually transmitted diseases, chronic obstructive pulmonary disease, ischemic heart disease. (Am J Prev Med 1998;14:245–258) © 1998 American Journal of Preventive Medicine

## Finding Your ACE Score

### While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household **often or very often**...  
Swear at you, insult you, put you down, or humiliate you?  
**or**  
Act in a way that made you afraid that you might be physically hurt?  
Yes No If yes enter 1 \_\_\_\_\_
2. Did a parent or other adult in the household **often or very often**...  
Push, grab, slap, or throw something at you?  
**or**  
**Ever** hit you so hard that you had marks or were injured?  
Yes No If yes enter 1 \_\_\_\_\_
3. Did an adult or person at least 5 years older than you **ever**...  
Touch or fondle you or have you touch their body in a sexual way?  
**or**  
Attempt or actually have oral, anal, or vaginal intercourse with you?  
Yes No If yes enter 1 \_\_\_\_\_
4. Did you **often or very often** feel that ...  
No one in your family loved you or thought you were important or special?  
**or**  
Your family didn't look out for each other, feel close to each other, or support each other?  
Yes No If yes enter 1 \_\_\_\_\_
5. Did you **often or very often** feel that ...  
You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?  
**or**  
Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?  
Yes No If yes enter 1 \_\_\_\_\_
6. Were your parents **ever** separated or divorced?  
Yes No If yes enter 1 \_\_\_\_\_
7. Was your mother or stepmother:  
**Often or very often** pushed, grabbed, slapped, or had something thrown at her?  
**or**  
**Sometimes, often, or very often** kicked, bitten, hit with a fist, or hit with something hard?  
**or**  
**Ever** repeatedly hit at least a few minutes or threatened with a gun or knife?  
Yes No If yes enter 1 \_\_\_\_\_
8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?  
Yes No If yes enter 1 \_\_\_\_\_
9. Was a household member depressed or mentally ill, or did a household member attempt suicide?  
Yes No If yes enter 1 \_\_\_\_\_
10. Did a household member go to prison?  
Yes No If yes enter 1 \_\_\_\_\_

Now add up your "Yes" answers: \_\_\_\_\_ This is your ACE Score.

# WHAT ARE THEY?

ACEs *are*  
**ADVERSE  
 CHILDHOOD  
 EXPERIENCES**

The three types of ACEs include

## ABUSE



Physical



Emotional



Sexual

## NEGLECT



Physical



Emotional

## HOUSEHOLD DYSFUNCTION



Mental Illness



Incarcerated Relative



Mother treated violently



Substance Abuse

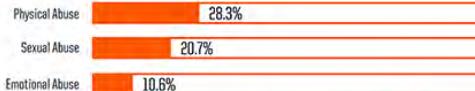


Divorce

# HOW PREVALENT ARE ACEs?

The ACE study\* revealed the following estimates:

## ABUSE

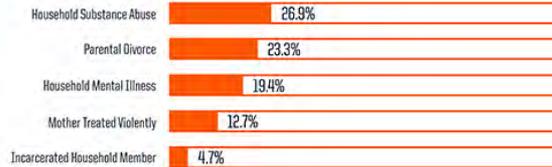


percentage of study participants that experienced a specific ACE

## NEGLECT



## HOUSEHOLD DYSFUNCTION



# WHAT IMPACT DO ACEs HAVE?

As the number of ACEs increases, so does the risk for negative health outcomes



Possible Risk Outcomes:

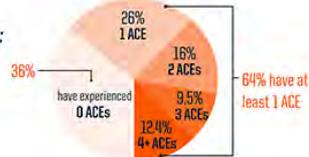
## BEHAVIOR



## PHYSICAL & MENTAL HEALTH

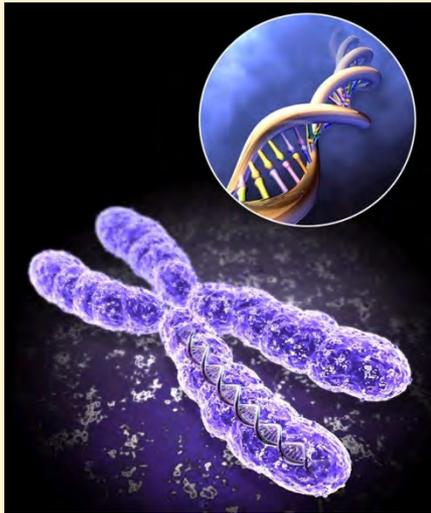


Of 17,000 ACE study participants:



# Talk Early, Talk Often

“Delay, Delay, Delay or Avoid Altogether”



Genetics

+



Trauma

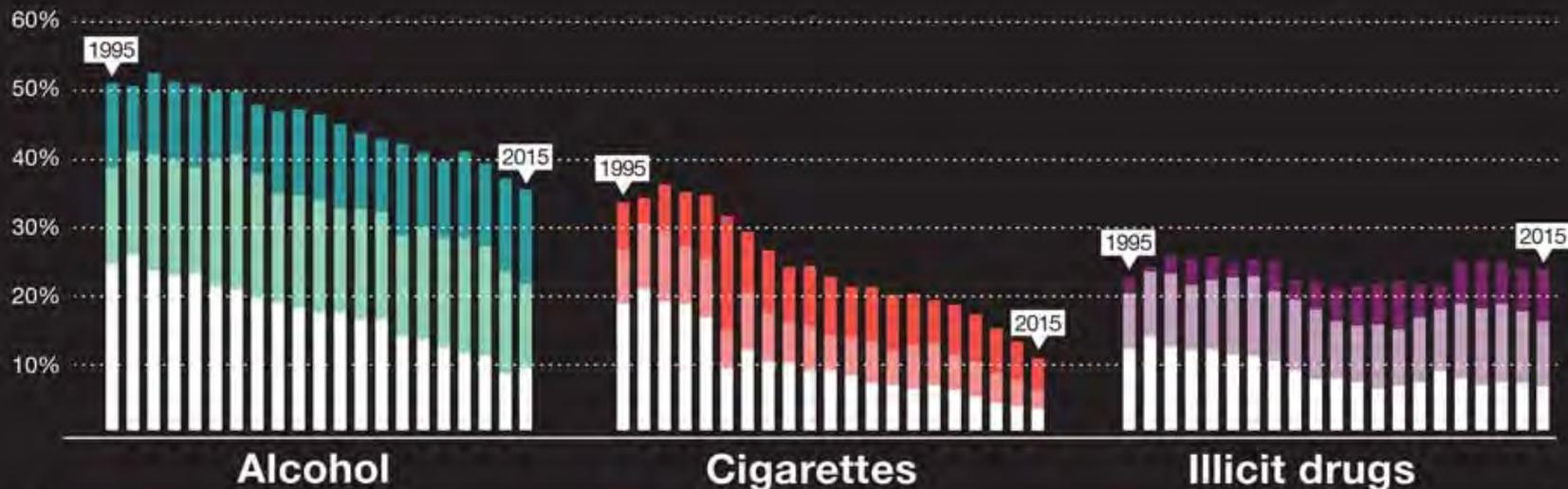
+



Early Use

# LAST TWO DECADES OF ALCOHOL, CIGARETTE, AND ILLICIT DRUG USE\*

\*Past-month use



2015

 35.3% OF 12TH GRADERS  
 21.5% OF 10TH GRADERS  
 9.7% OF 8TH GRADERS

 11.4% OF 12TH GRADERS  
 6.3% OF 10TH GRADERS  
 3.6% OF 8TH GRADERS

 23.6% OF 12TH GRADERS  
 16.5% OF 10TH GRADERS  
 8.1% OF 8TH GRADERS



[WWW.DRUGABUSE.GOV](http://WWW.DRUGABUSE.GOV)

## BINGE DRINKING RATES STEADY AFTER DECADES OF DECLINE



\*Binge drinking is defined as having 5 or more drinks in a row in the last 2 weeks.

**BINGE DRINKING APPEARS TO HAVE LEVELED OFF THIS YEAR, BUT IS SIGNIFICANTLY LOWER THAN PEAK YEARS.**



National Institute  
on Drug Abuse

DRUGABUSE.GOV

# TOBACCO PRODUCT USE BY HIGH SCHOOL STUDENTS (2011-2016)

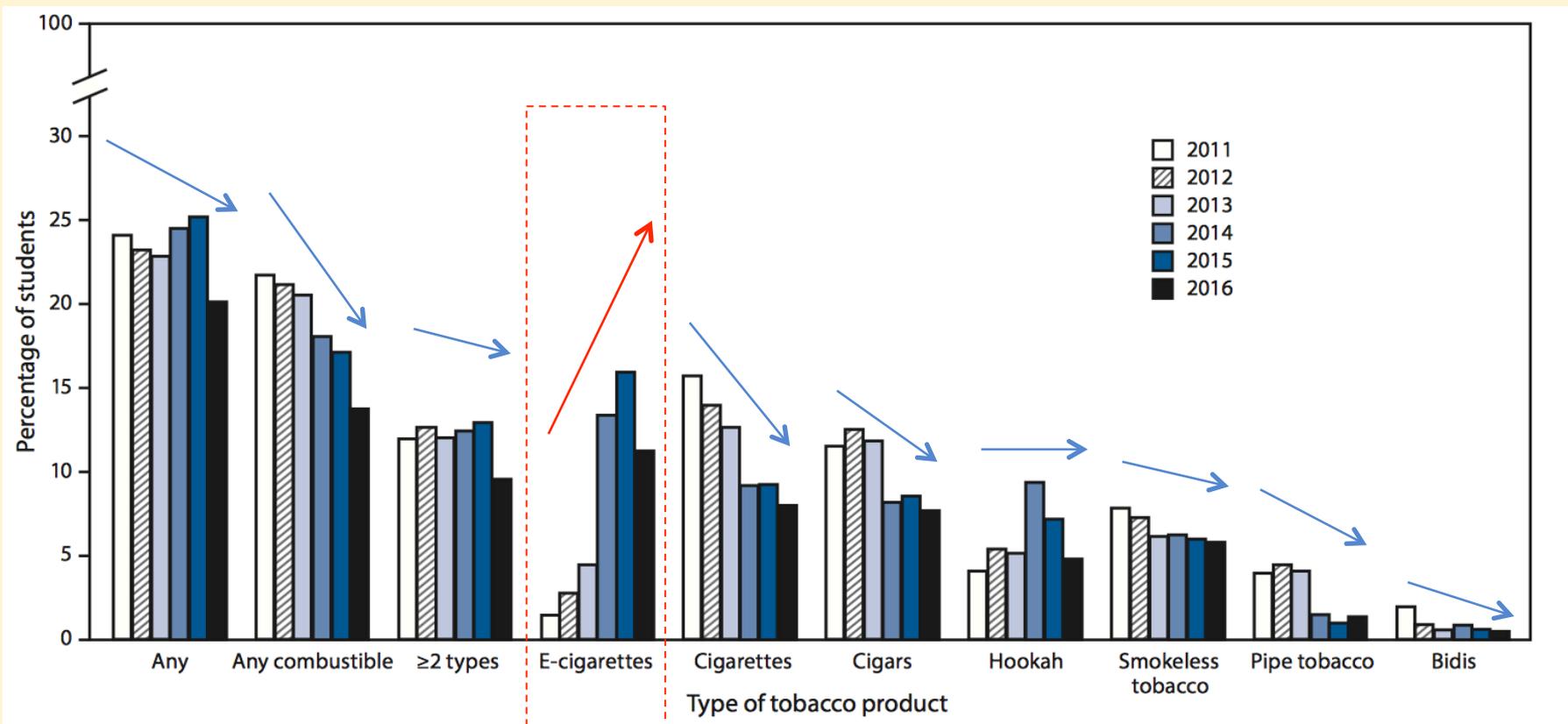
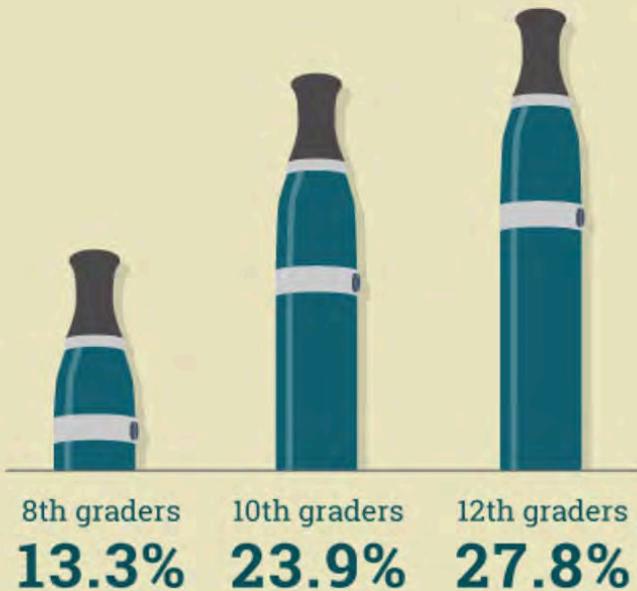
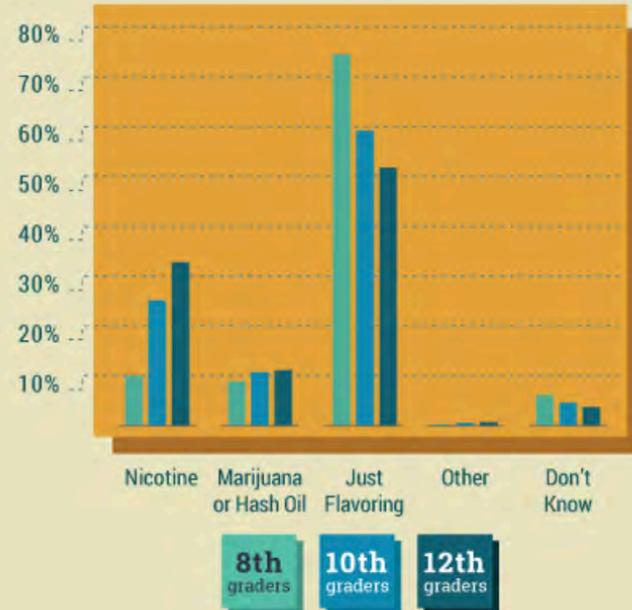


Figure 1. Estimated percentage of **high school students** who currently use any tobacco products, any combustible tobacco products,  $\geq 2$  tobacco products, and selected tobacco products – National Youth Tobacco Survey, United States. 2011-2016.

# PAST-YEAR E-VAPORIZER USE AND WHAT TEENS ARE INHALING



When asked what they thought was in the e-vaporizer mist students inhaled the last time they smoked, these were their responses:



NEARLY 1 IN 3 STUDENTS IN 12TH GRADE REPORT PAST-YEAR USE OF E-VAPORIZERS, RAISING CONCERNS ABOUT THE IMPACT ON THEIR LONG-TERM HEALTH.



# The Nicotine Content of a Sample of E-cigarette Liquid Manufactured in the United States

Raymond, Barrett H. BSN, RN, FNP-S, NREMT-P; Collette-Merrill, Katreena PhD, RN; Harrison, Roger G. PhD; Jarvis, Sabrina DNP, FNP-BC, ACNP-BC, FAANP; Rasmussen, Ryan Jay MS, RN, FNP

Journal of Addiction Medicine: December 26, 2017 - Volume Publish Ahead of Print - Issue - p  
doi: 10.1097/ADM.0000000000000376  
Original Research: PDF Only

BUY PAP

Abstract

Author Information

SD = 3.3) nicotine. The labeled 18 mg/mL samples measured as little as 35% less nicotine and as much as 52% greater nicotine. In the 35 samples labeled 0 mg/mL, nicotine was detected ( $>0.01$  mg/mL) in 91.4% of the samples (range 0–23.9 mg/mL;  $M = 2.9$ ,  $SD = 7.2$ ). Six samples from 2 manufacturers labeled as 0 mg/mL were found to contain nicotine in amounts ranging from 5.7 to 23.9 mg/mL.

popular flavors from each manufacturer were purchased in nicotine concentrations of 0 and 18 mg/mL. Of the samples purchased ( $n = 70$ ), all were labeled as produced in the United States of America. The researchers anonymized the samples before sending them to an independent university laboratory for testing.

**Results:** The 35 e-liquid samples labeled 18 mg/mL nicotine measured between 11.6 and 27.4 mg/mL ( $M = 18.7$ ,  $SD = 3.3$ ) nicotine. The labeled 18 mg/mL samples measured as little as 35% less nicotine and as much as 52% greater nicotine. In the 35 samples labeled 0 mg/mL, nicotine was detected ( $>0.01$  mg/mL) in 91.4% of the samples (range 0–23.9 mg/mL;  $M = 2.9$ ,  $SD = 7.2$ ). Six samples from 2 manufacturers labeled as 0 mg/mL were found to contain nicotine in amounts ranging from 5.7 to 23.9 mg/mL.

**Conclusion:** This study demonstrates the nicotine labeling inaccuracies present in current e-liquid solutions produced in the United States. Incorrect labeling poses a significant risk to consumers and supports the recent regulation changes enacted by the US Food and Drug Administration. Additional routine testing of nicotine concentrations should be conducted to evaluate the effectiveness of the regulations on future e-liquid production.

## One Mad Hit Juice Box

- [NEwhere Inc. d/b/a Mad Hatter Juice](#)



E-liquid



Food product

## Whip'd Strawberry

- [Cosmic Fog Vapors d/b/a Next Day Vapor Products](#)
- [Elite Vaporworks](#)



E-liquid



Food product

## V'Nilla Cookies & Milk

- [Tinted Brew, Inc.](#)
- [Fog It Up](#)



E-liquid



Food product

# JUUL e-cigarettes

Some e-cigarette critics are calling the JUUL e-cigarette the “Apple of vaping” or the “iPhone of vaping.” With its relatively low entry price, sleek portable design, ease of use, and nicotine head rush it generates for users, JUULS are catching on with younger people.

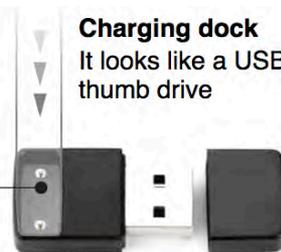
**JUUL flavor pods**



\*Contains one JUULpod each of Virginia Tobacco, Cool Mint, Fruit Medley and Creme Brulee. Each JUULpod contains 0.7mL with 5% nicotine by weight, approximately equivalent to 1 pack of cigarettes or 200 puffs.

The design of the e-cigarette is about the same size as a cigarette and weighs a couple of grams.

**Body**



**Charging dock**  
It looks like a USB thumb drive

## **USB charging dock**

The battery is charged by dropping the body on a magnetic USB adapter. It takes an hour to fully charge and will last up to 200 puffs, a full day of regular use.

The cigarette's body is designed to contain a built-in battery.



# Teenage Brains are Malleable and Vulnerable





# Have Smartphones Destroyed a Generation?

More comfortable online than out partying, post-Millennials are safer, physically, than adolescents have ever been. But they're on the brink of a mental-health crisis.

*The Atlantic*

[JEAN M. TWENGE](#)

[SEPTEMBER 2017 ISSUE](#)

THE RECORDER  
New England's 2012 Newspaper of the Year

**VACATION** **CRUISE SHIPMENTS**

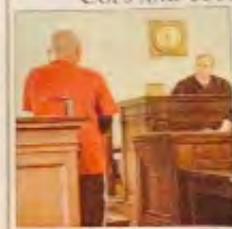
**ADDICTION AND ANGUISH**  
"It is easier to get a bag of heroin than it is to buy a bag of pot these days" — Jeff Kain Ivers



THE RECORDER  
New England's 2012 Newspaper of the Year

**COPS AND COURTS COPE**  
More than 60 percent of district court cases derive from cases of substance abuse

**IRS boss ousted**  
After 60 percent of the Franklin County jail inmates have substance abuse problems



**Heroin cuts a wide swath**

**A SLIDE INTO ADDICTION**  
Medicine prescription opioids cause the same brain risk as heroin when abused, but heroin brings additional risks as an unregulated substance made and sold by criminals



**Prescriptions a path to heroin**

**HEROIN in Franklin County**

**finding a way out of addiction**

**THE SCHEDULE**

TUESDAY	WEDNESDAY	THURSDAY	TODAY
Franklin County	Franklin County	Franklin County	Franklin County

**6 dead as tornadoes whip through North Texas**



**Town meetings & elections**

**THE RECORDER**  
Serving the people of Franklin County and the North Quabbin Region

**Town Election**

**PUSHING BACK** Addiction in Franklin County

**What do Deerfield private schools pay the town?**

**WE CAN'T ARREST OUR WAY OUT OF THIS**



**Sour Sunday**

**THE RECORDER**  
Serving the people of Franklin County and the North Quabbin Region

**Chandler Athletics Again**

**Weather**

**PUSHING BACK** Addiction in Franklin County

**HEARING THE CRIES FOR HELP**

**Casino challenge gets down in court**

# TIME

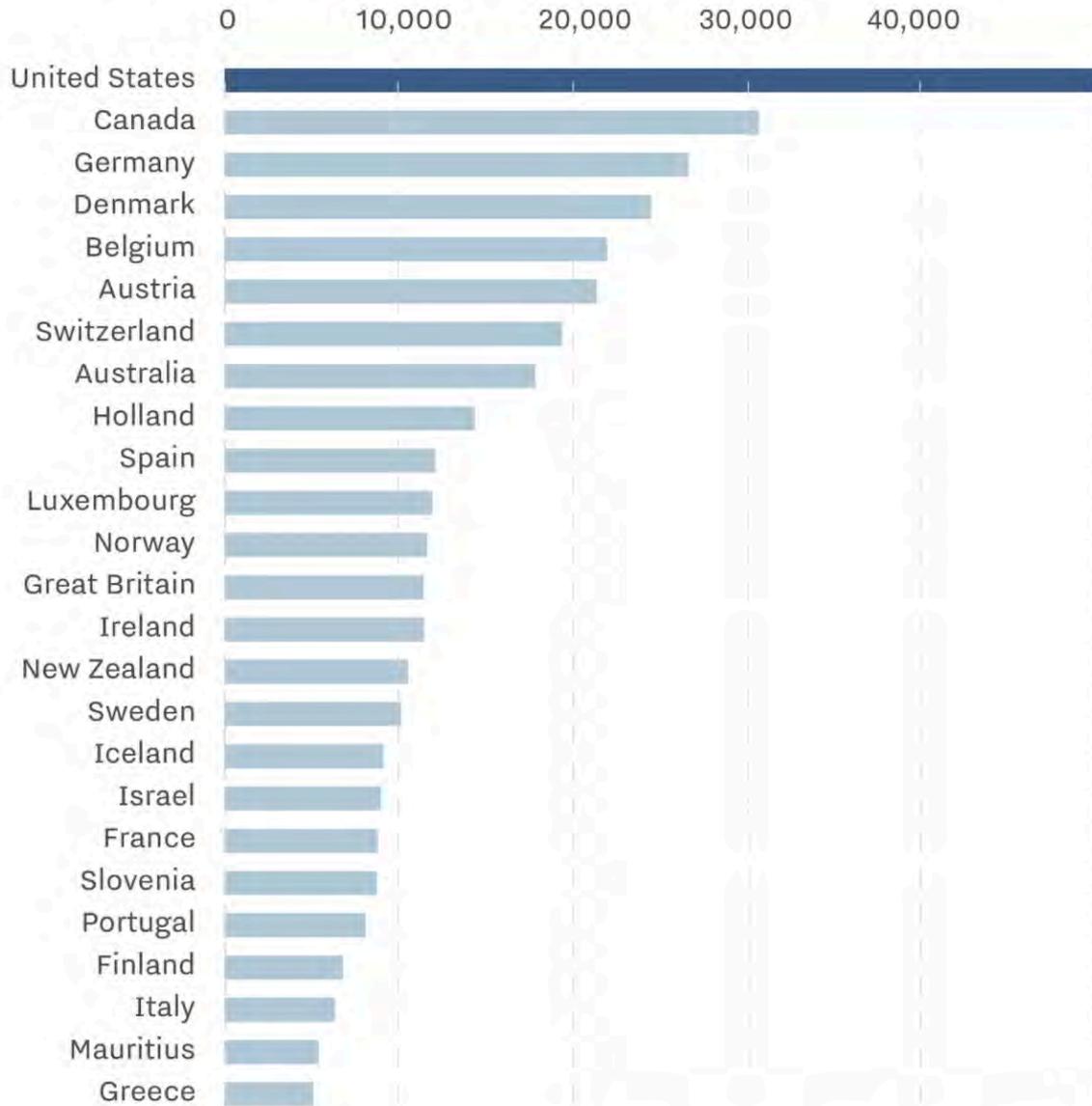
They're the most  
**powerful  
painkillers**  
ever invented.

And they're creating  
the worst addiction  
crisis America  
has ever seen.

By Massimo Calabresi



## Standard daily opioid dose for every 1 million people



Source: United Nations International Narcotics Control Board

Credit: Sarah Frostenson

**Vox**

# Chronic Use of Opioid Analgesics in Non-Malignant Pain: Report of 38 Cases

Russell K. Portenoy and Kathleen M. Foley

*Pain Service, Department of Neurology, Memorial Sloan-Kettering Cancer Center, and Department of Neurology, Cornell University Medical College, New York, NY 10021 (U.S.A.)*

(Received 10 June 1985, accepted 28 October 1985)

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## Summary

Thirty-eight patients maintained on opioid analgesics for non-malignant pain were retrospectively evaluated to determine the indications, course, safety and efficacy of this therapy. Oxycodone was used by 12 patients, methadone by 7, and levorphanol by 5; others were treated with propoxyphene, meperidine, codeine, pentazocine, or some combination of these drugs. Nineteen patients were treated for four or more years at the time of evaluation, while 6 were maintained for more than 7 years. Two-thirds required less than 20 morphine equivalent mg/day and only 4 took more than 40 mg/day. Patients occasionally required escalation of dose and/or hospitalization for exacerbation of pain; doses usually returned to a stable baseline afterward. Twenty-four patients described partial but acceptable or fully adequate relief of pain, while 14 reported inadequate relief. No patient underwent a surgical procedure for pain management while receiving therapy. Few substantial gains in employment or social function could be attributed to the institution of opioid therapy. No toxicity was reported and management became a problem in only 2 patients, both with a history of prior drug abuse. A critical review of patient characteristics, including data from the 16 Personality Factor Questionnaire in 24 patients, the Minnesota Multiphasic Personality Inventory in 23, and detailed psychiatric evaluation in 6, failed to disclose psychological or social variables capable of explaining the success of long-term management. We conclude that opioid maintenance therapy can be a safe, salutary and more humane alternative to the options of surgery or no treatment in those patients with intractable non-malignant pain and no history of drug abuse.

# Drug Deaths in America Are Rising Faster Than Ever

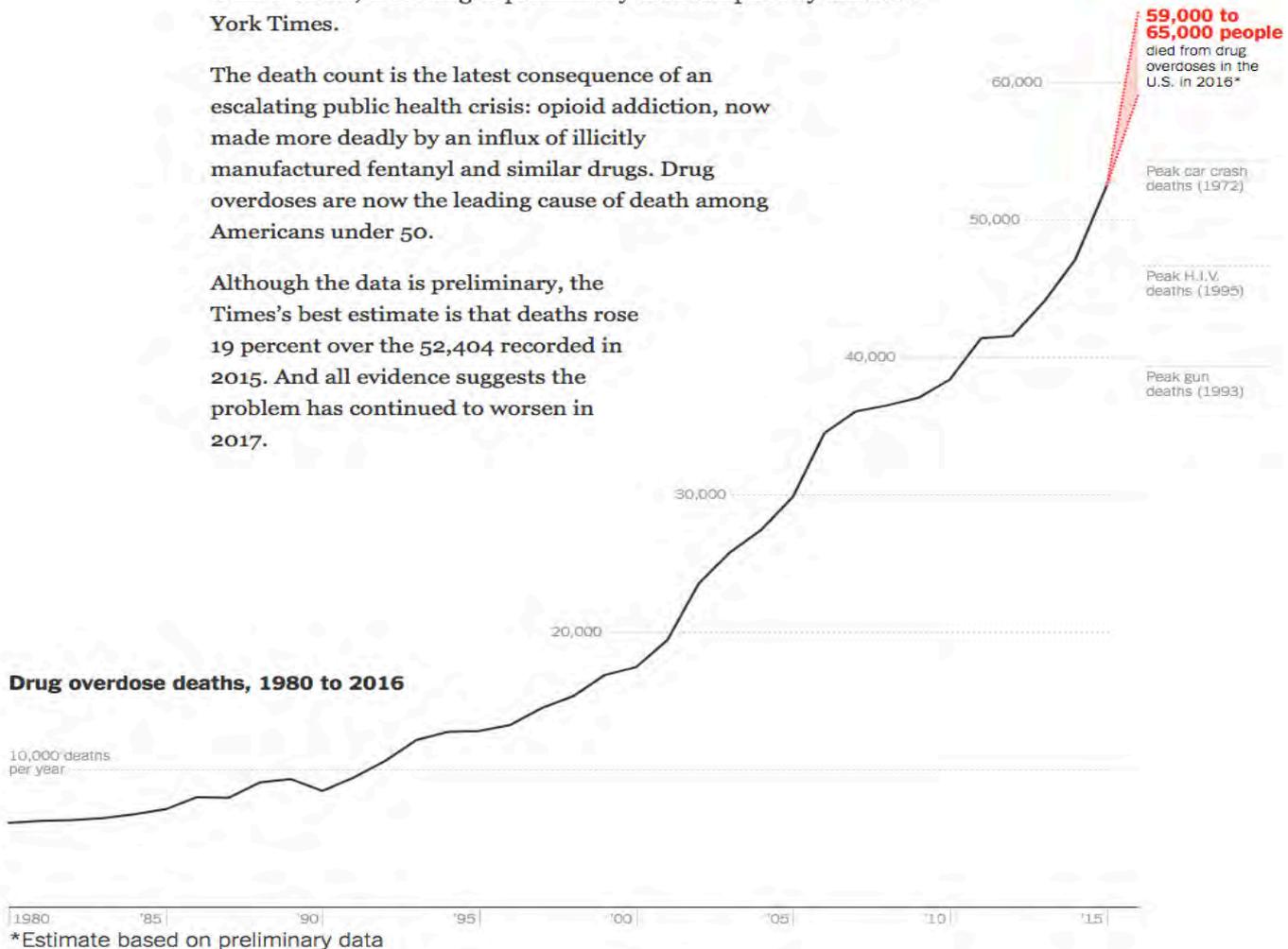
By **JOSH KATZ** JUNE 5, 2017

New data compiled from hundreds of health agencies reveals the extent of the drug overdose epidemic last year.

AKRON, Ohio — Drug overdose deaths in 2016 most likely exceeded 59,000, the largest annual jump ever recorded in the United States, according to preliminary data compiled by The New York Times.

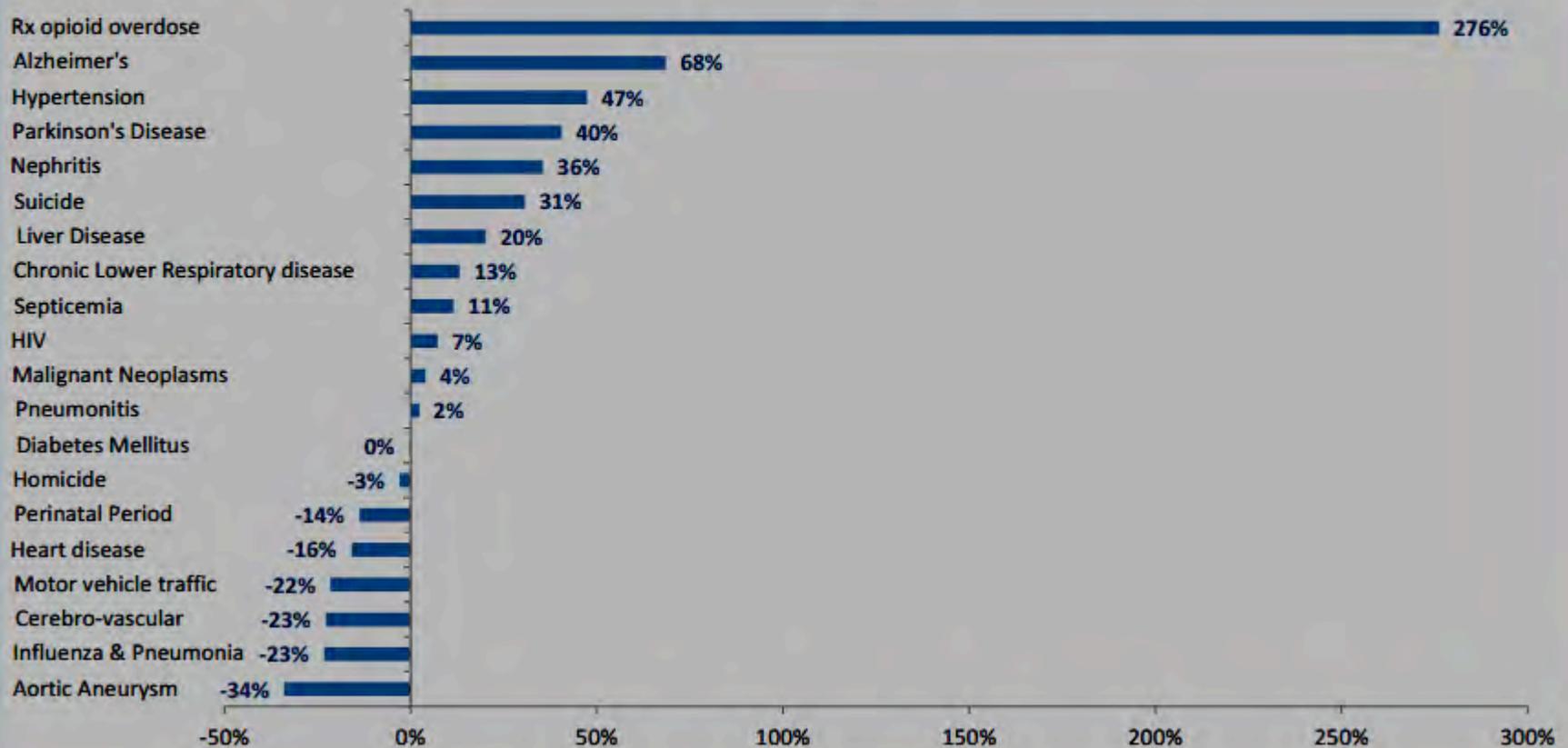
The death count is the latest consequence of an escalating public health crisis: opioid addiction, now made more deadly by an influx of illicitly manufactured fentanyl and similar drugs. Drug overdoses are now the leading cause of death among Americans under 50.

Although the data is preliminary, the Times's best estimate is that deaths rose 19 percent over the 52,404 recorded in 2015. And all evidence suggests the problem has continued to worsen in 2017.



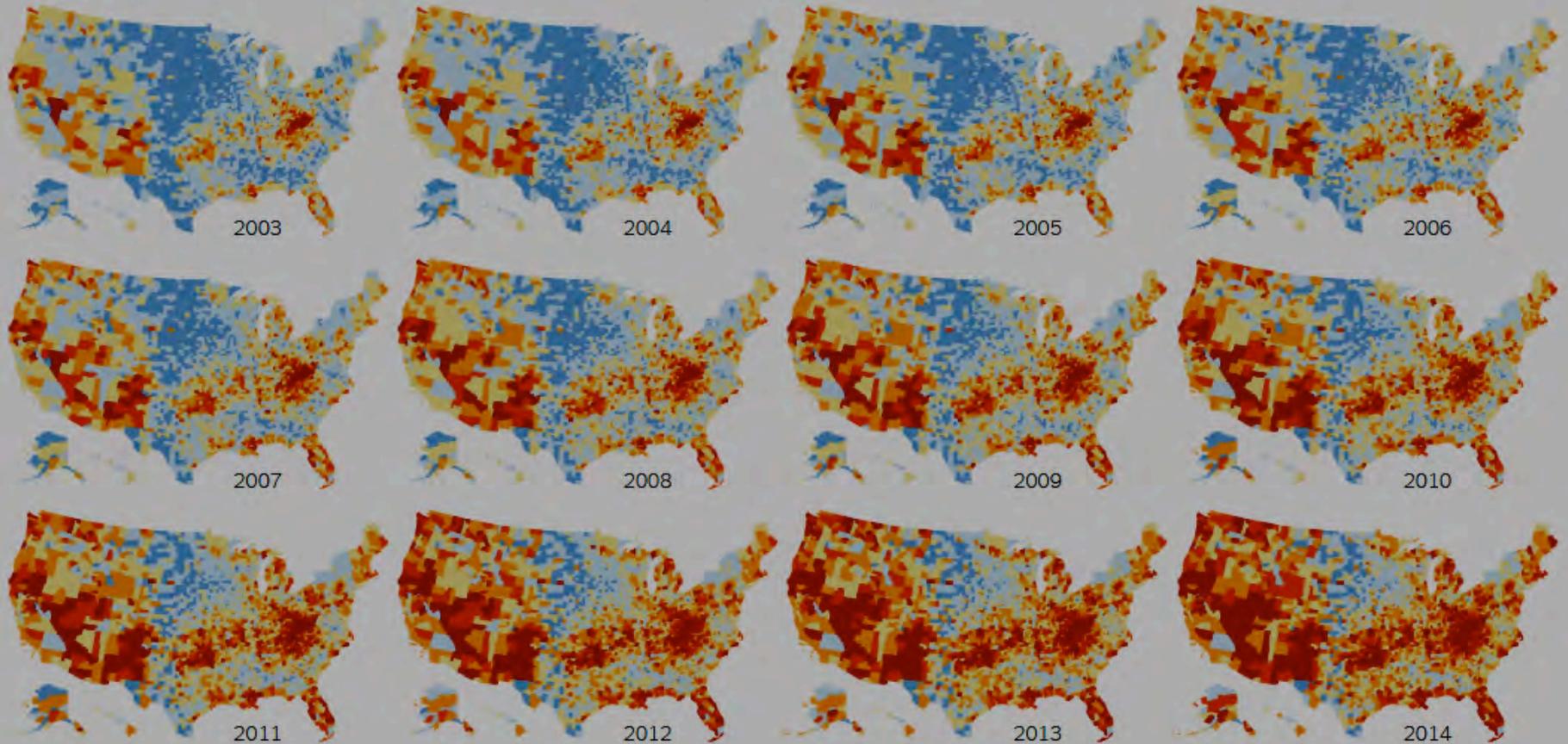
# Opioid pain reliever-related overdose deaths increasing at a faster rate than deaths from any major cause

% change in number of deaths, United States, 2000-2010



# Deaths Ripples Across America

By HAEYOUN PARK and MATTHEW BLOCH JAN. 19, 2016



NYT January 19, 2016





## Florida Shutting 'Pill Mill' Clinics



Tim Chapman/Miami Herald, via Associated Press

At an Aug. 15 news conference, Florida officials displayed prescription drugs that were surrendered to the state by pain clinics.

By LIZETTE ALVAREZ

Published: August 31, 2011

WEST PALM BEACH, Fla. — Florida has long been the nation's center of the illegal sale of prescription drugs: Doctors here bought 89 percent of all the Oxycodone sold in the country last year. At its peak, so many out-of-staters flocked to Florida to buy drugs at more than 1,000 pain clinics that the state earned the nickname "Oxy Express."

### Related

Times Topics: [OxyContin \(Drug\)](#) | [Prescription Drug Abuse](#)

[Enlarge This Image](#)



Joe Raedle/Getty Images

Florida Gov. Rick Scott attends a

But with the help of tougher laws, officials have moved aggressively this year to shut down so-called pill mills and disrupt the pipeline that moves the drugs north. In the past year, more than 400 clinics were either shut down or closed their doors.

Prosecutors have indicted dozens of pill mill operators, and nearly 80 doctors have seen their licenses suspended for prescribing mass quantities of pills without clear medical need.

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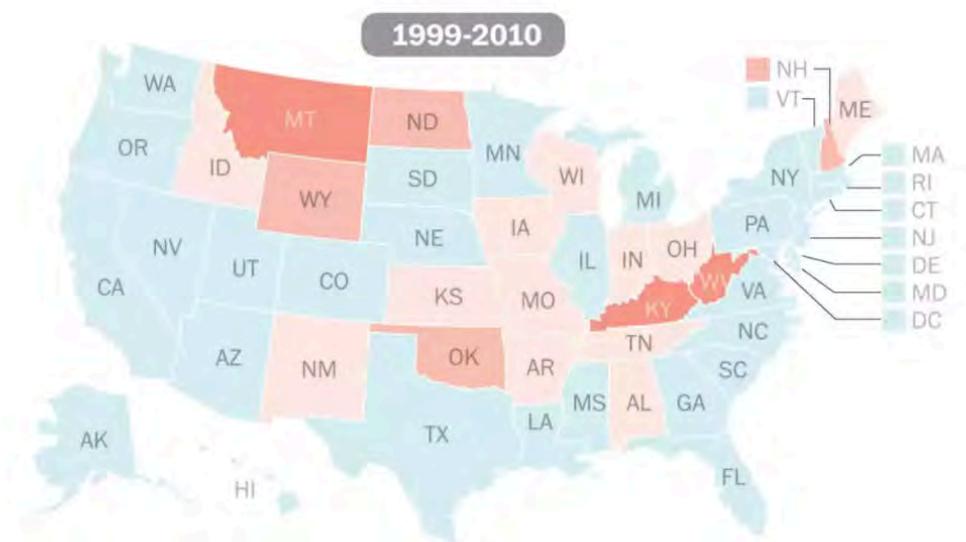
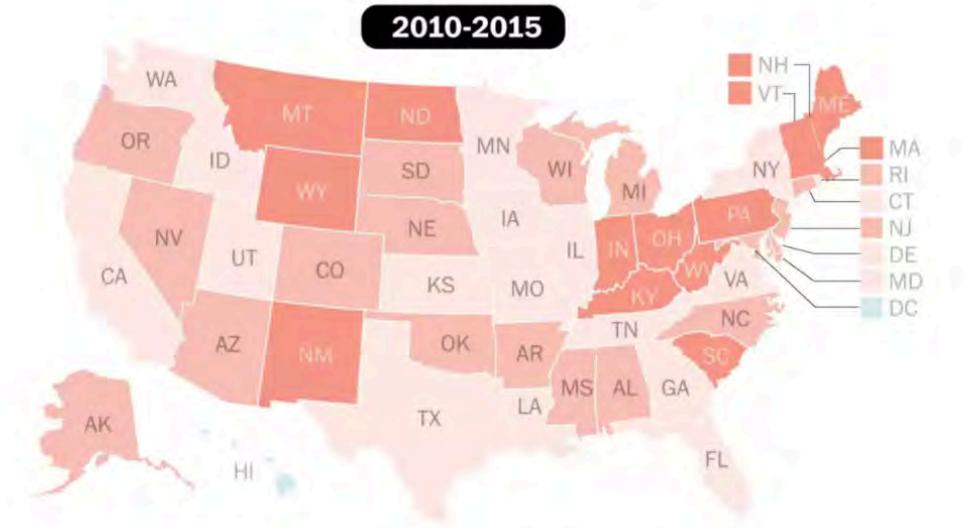


A cap, containing what looks like a dusting of heroin, sells for \$10.



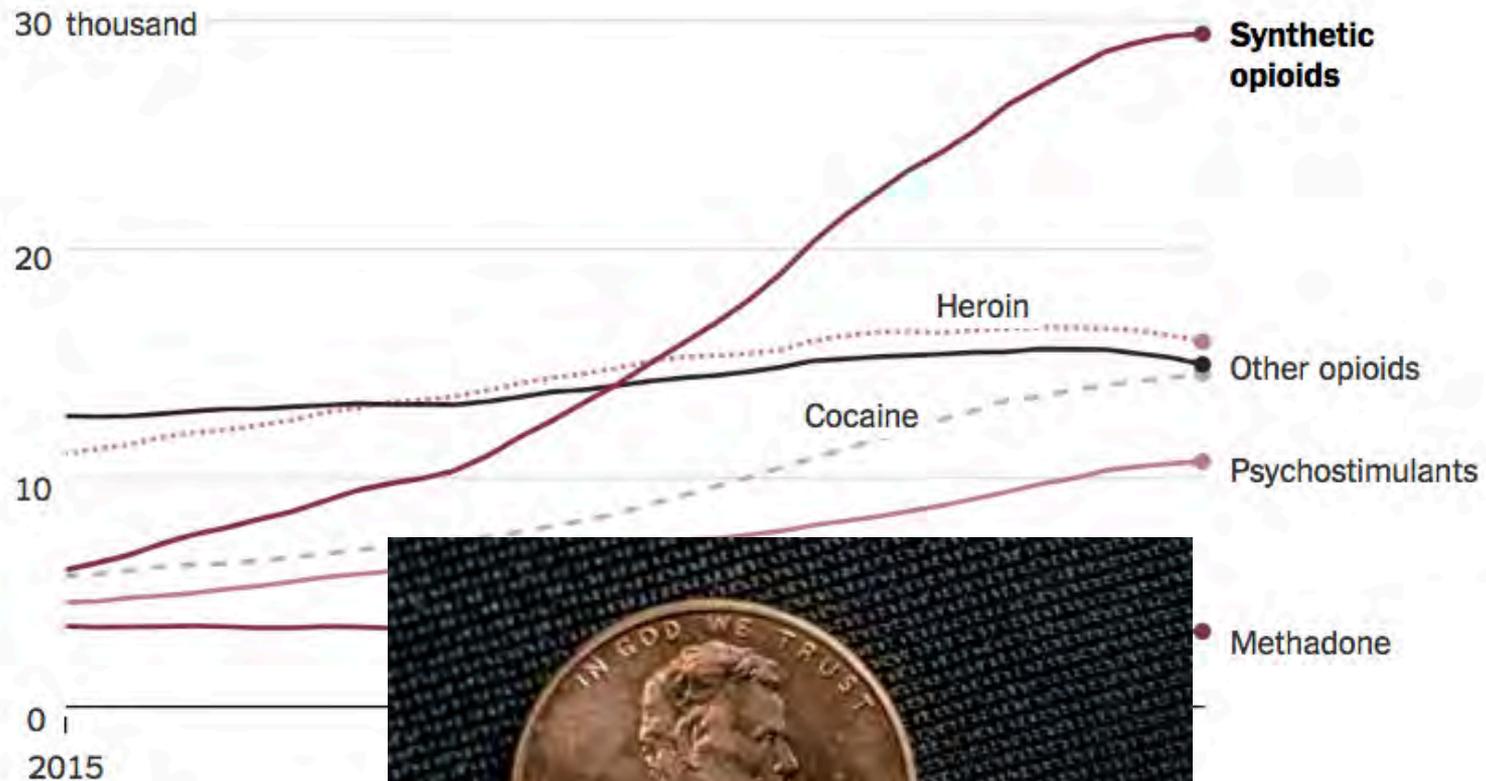
# DEATHS PER 100,000 PEOPLE. AGE 25 TO 44

● Decline   
 ● Increase up to 10   
 ● Increase up to 20   
 ● More than 20



# Synthetic Opioids Are Driving Up the Overdose Rate

Overdose deaths in thousands in preceding 12 months



Note: These numbers are preliminary. Some deaths involve more than one drug.

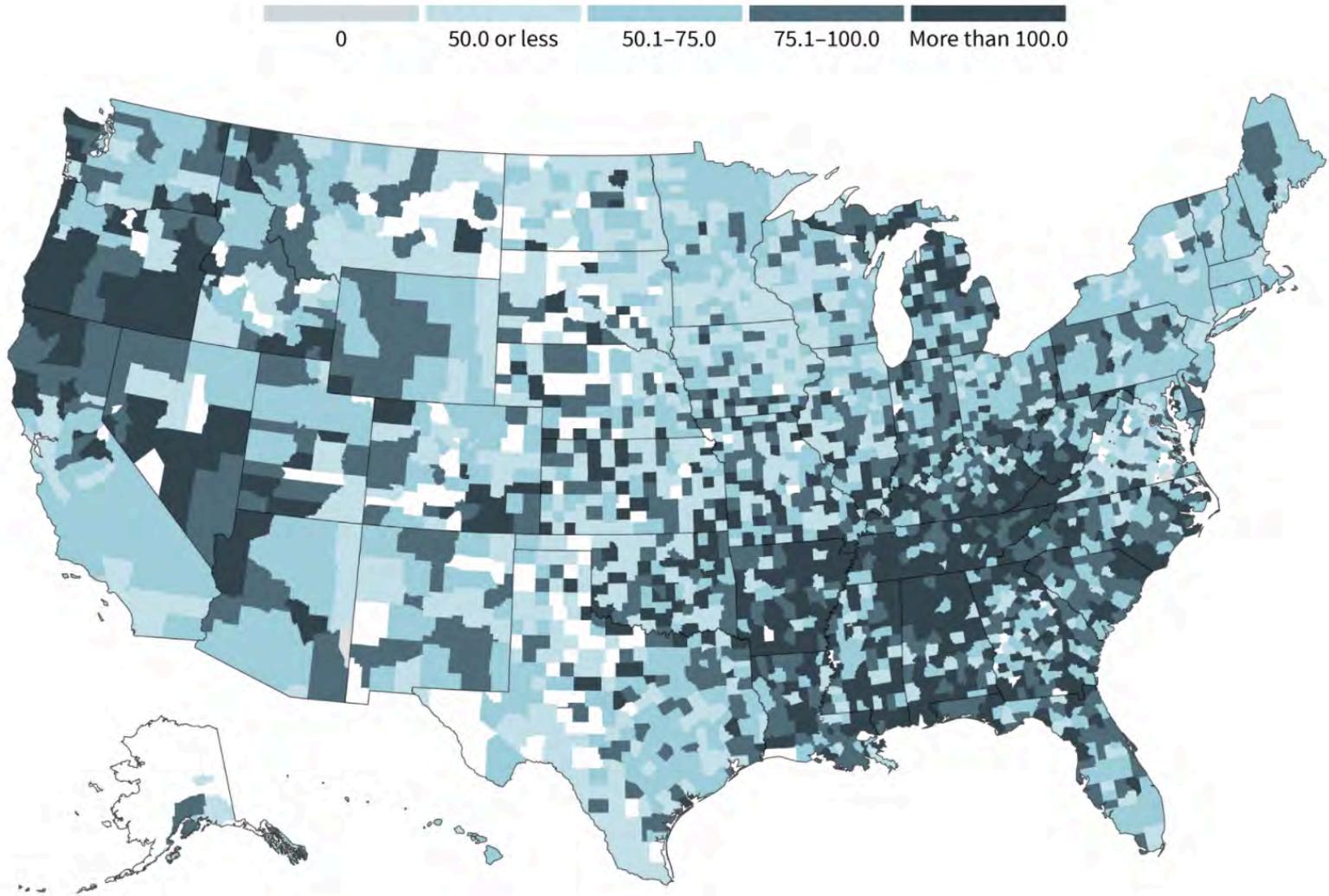
By The New York Times |



... are not completed.

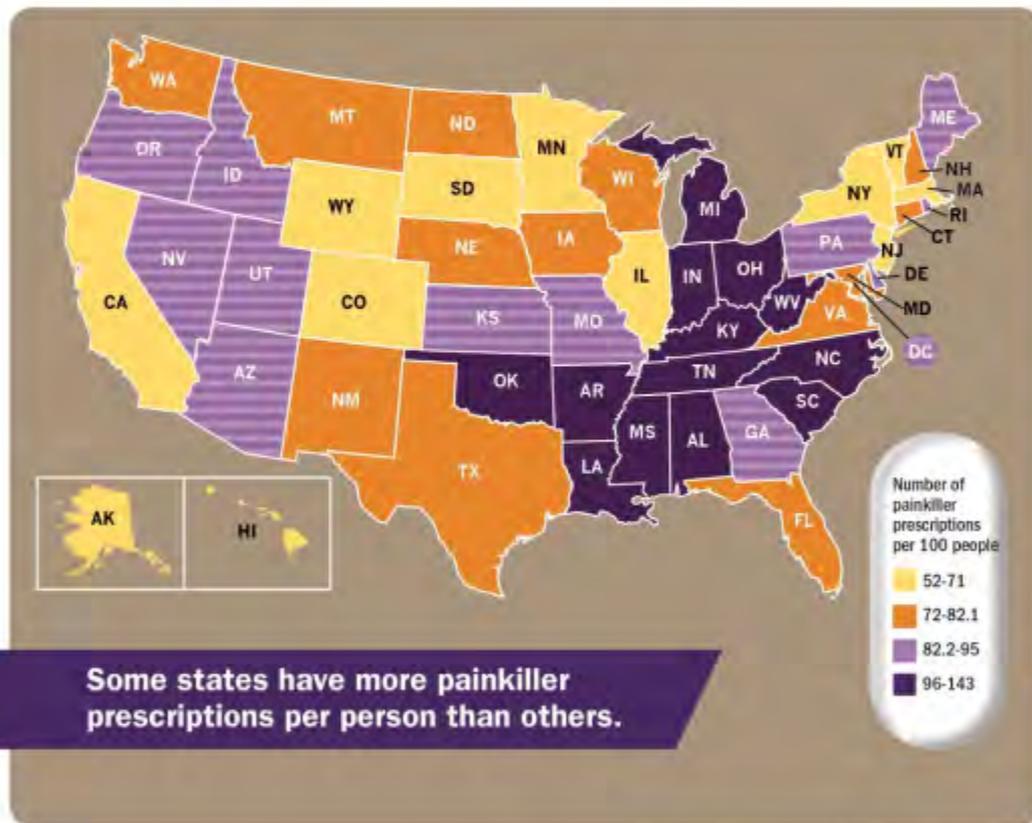
on

The map below shows the amount of retail opioid prescriptions dispensed per 100 people in 2016.



Note: Counties with insufficient data are left blank.

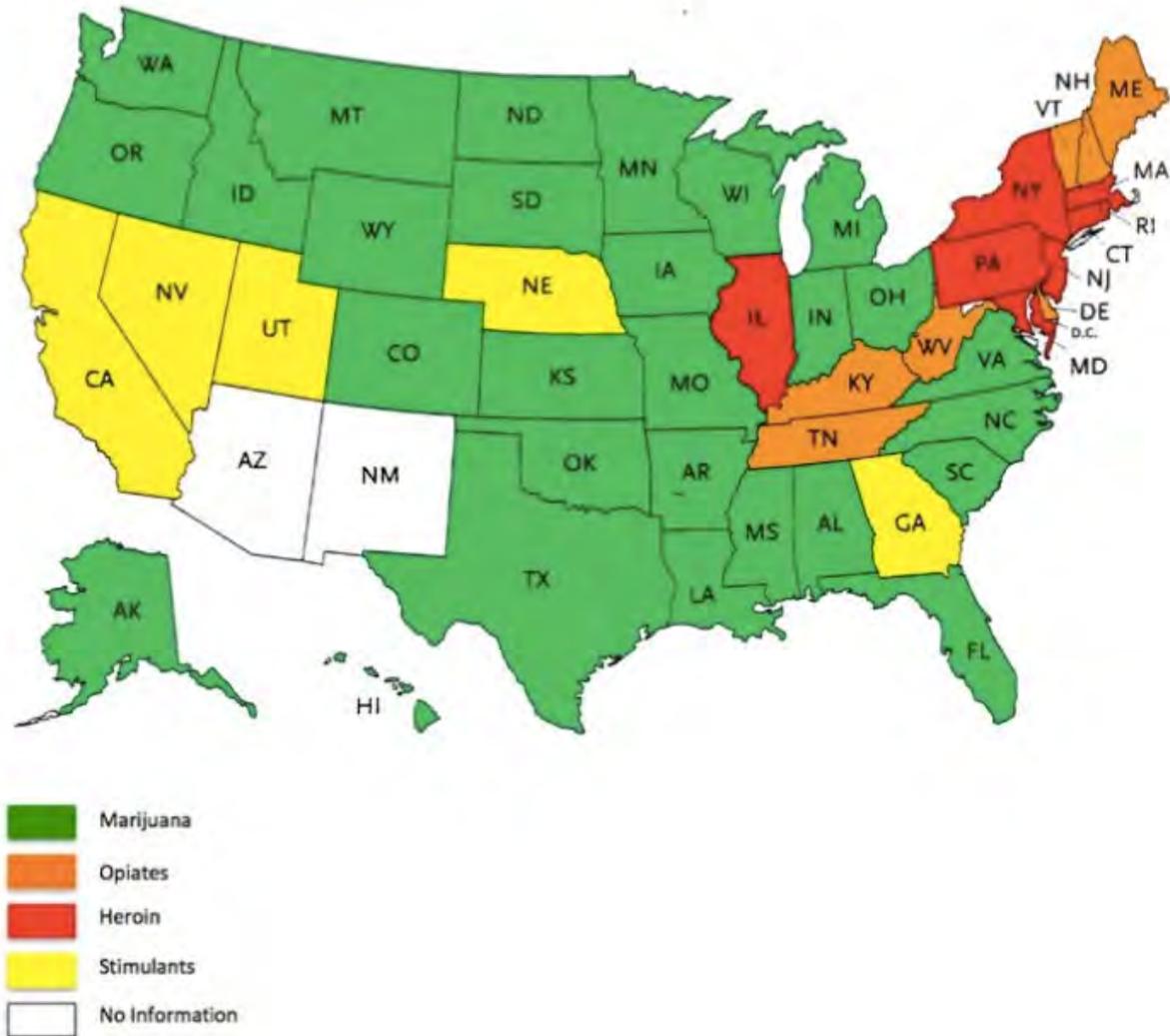
# Opioid pain reliever prescribing rates vary by state



SOURCE: CDC Vital Signs, July 2014. [cdc.gov/vitalsigns](http://cdc.gov/vitalsigns).

6. A large part of the problem has been the rise of of painkillers and heroin, especially in the Northeast.

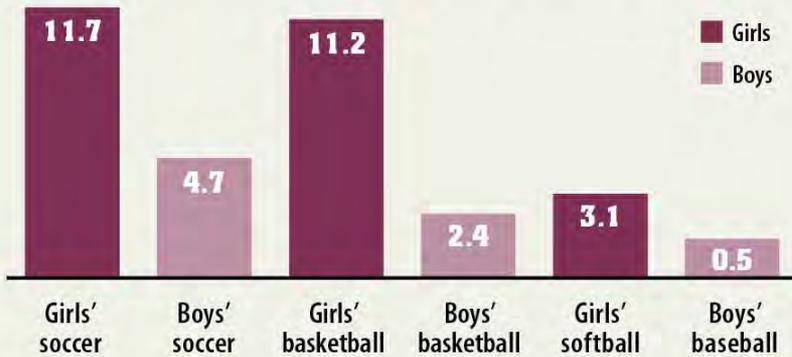
*(Map shows the drug most commonly cited in drug treatment admissions in each state)*





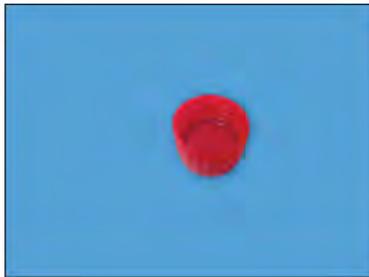
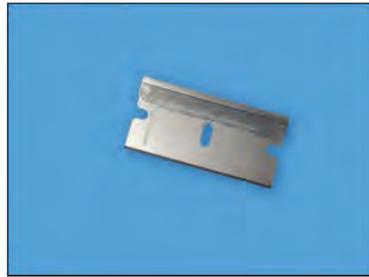
**FIGURE 2 High school ACL injury rates**

High school anterior cruciate ligament (ACL) injury rates per 100,000 athlete exposures (AEs) by sport and sex. (An athlete exposure is 1 athlete participating in 1 practice or competition.)



Adapted from Comstock RD, et al.<sup>3</sup>







**HELP**  
THOSE IN NEED



**GIVE**  
OVERDOSE RESCUE



**HOPE**  
FOR A LIFE SAVED

## Save a Life

### Learn how to respond to an overdose emergency

Get Naloxone Now is an online resource to train people to respond effectively to an opioid-associated overdose emergency. Get Naloxone Now advocates for widespread access to overdose education and training in how to administer naloxone, the life-saving antidote for opioid-associated overdose. Get Naloxone Now seeks to increase the number of lives saved by bystanders and professional first responders (police officers, firefighters and EMTs). Find out how you can contribute to reducing overdose deaths by accessing our online training modules.

**INDIVIDUALS-GET TRAINED!**

In as little as 20 minutes, you can learn techniques to save the life of a loved-one, friend, co-worker, neighbor ... anyone ... who is experiencing an overdose caused by prescription narcotics or heroin. You can also find out where you can obtain the lifesaving, easy-to-use antidote, naloxone, as well as access relevant

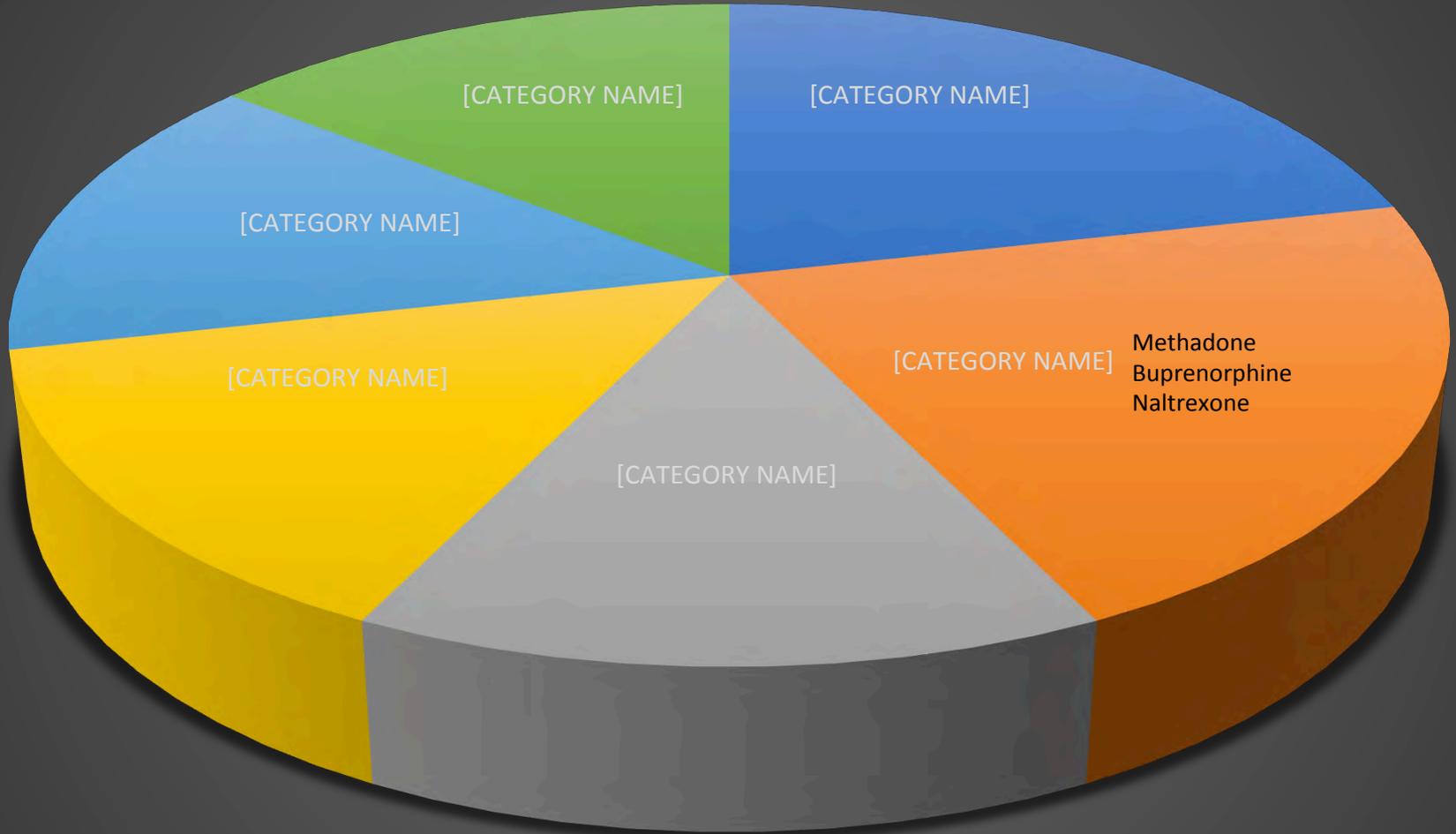
**INSTITUTIONAL PROGRAM**

Central to our mission to save lives is our institutional program. Targeted online training is available to professional first responders (police officers, firefighters, EMTs) through use of our first responder computer-based module.

**HOW CAN YOU HELP**

Our computer-based training modules can help you give someone a second chance, and spare those who love them the pain of a preventable loss of life or brain injury. The online training is provided free of charge. If you wish to obtain CE or CASAC credits (pending accreditation) after completing the module, a nominal

# What It Takes To Get Better



■ Stable & Sober Housing

■ Medicine

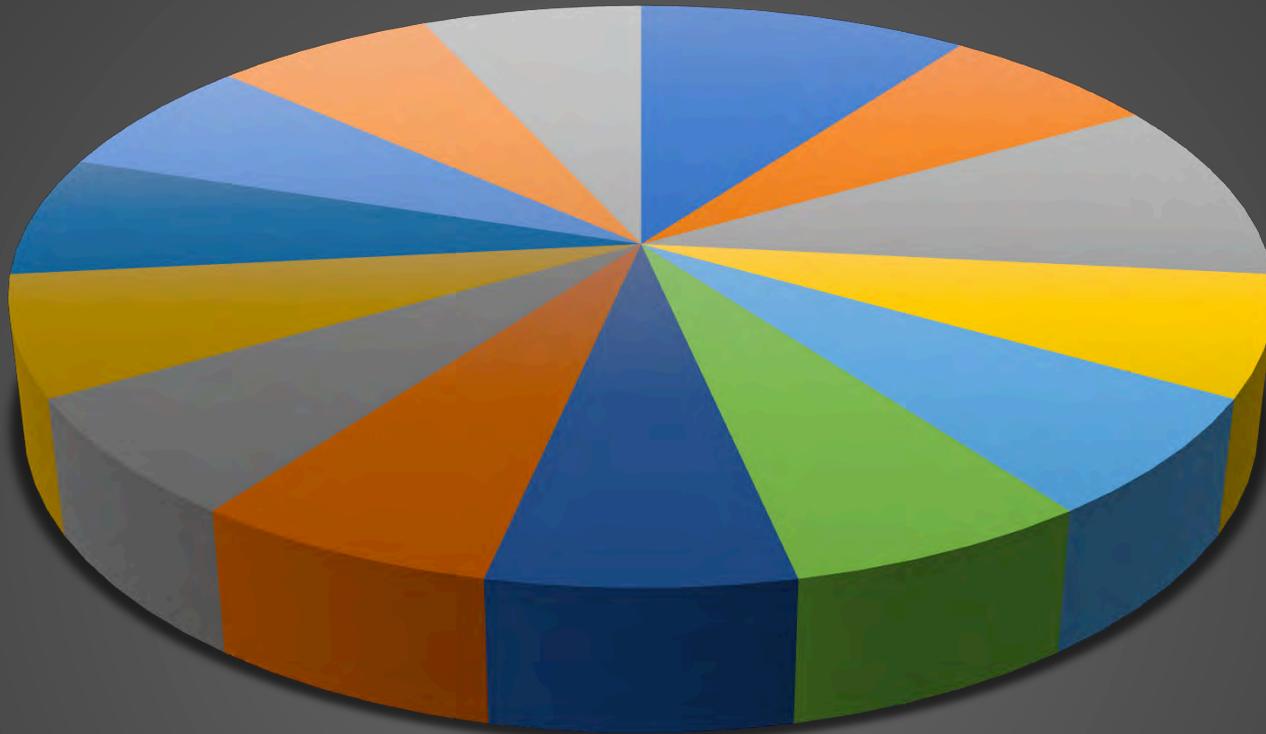
■ Mental Health Treatment

■ Positive Relationships

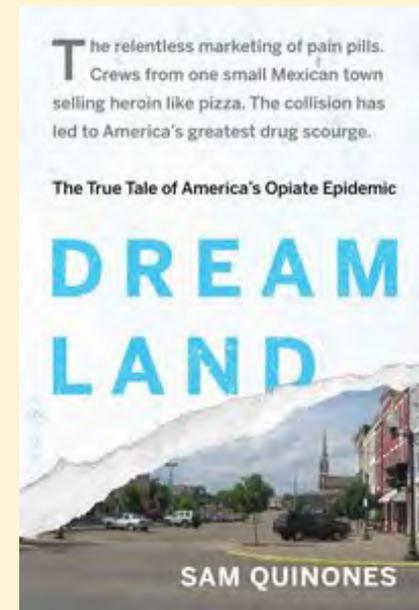
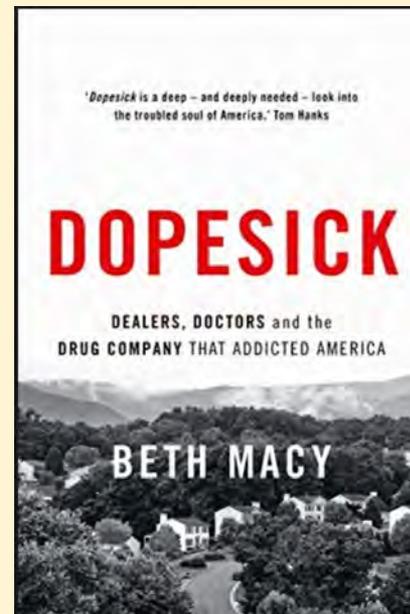
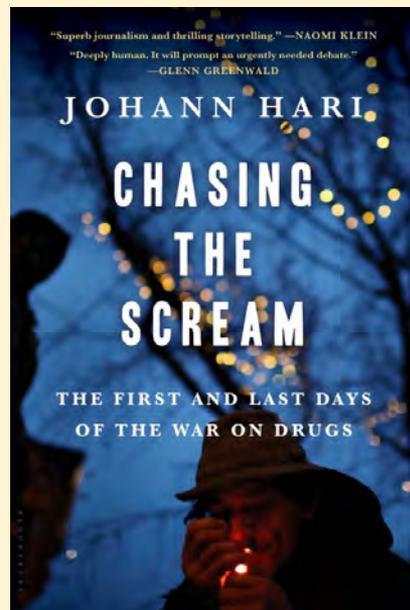
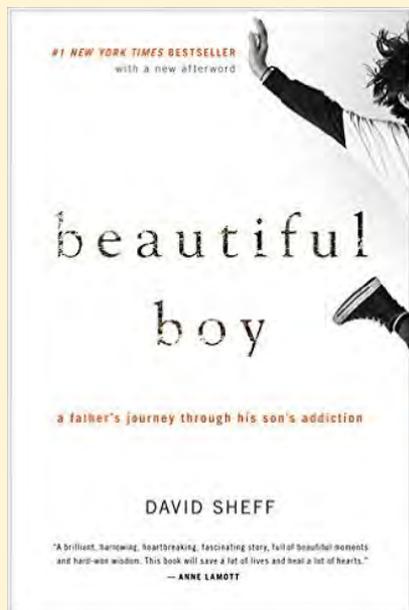
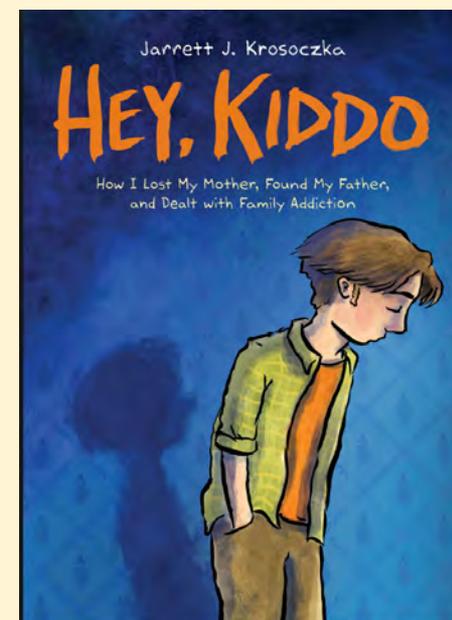
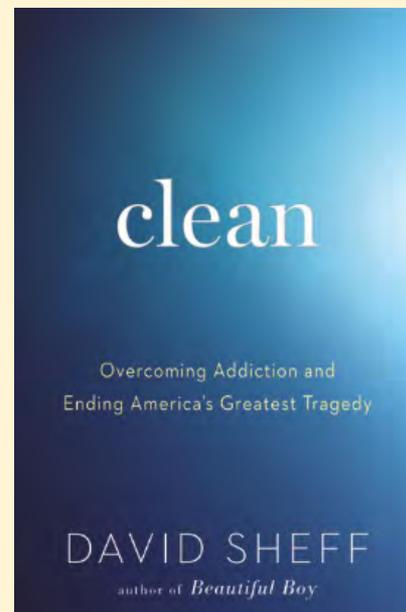
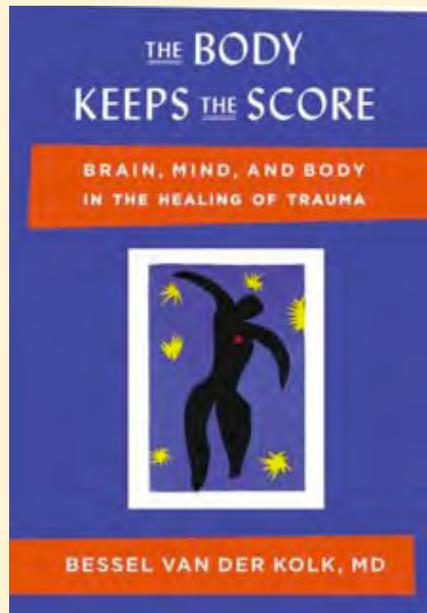
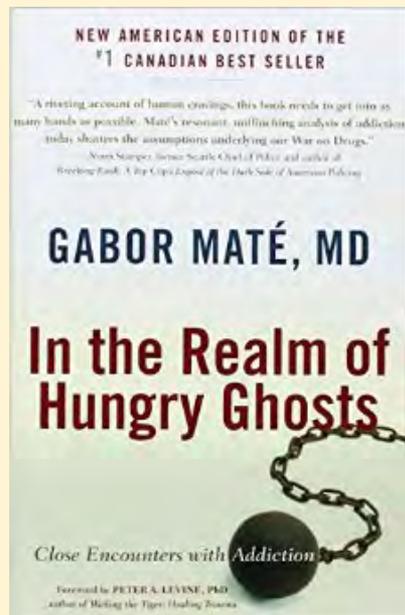
■ Physical Movement

■ Having a Sense of Purpose

# What It Takes To Get Better



- Stable & Sober Housing
- Mental Health Treatment
- Working
- Growing into an Adult Brain
- Hope
- Having a Sense of Purpose
- Positive Relationships
- Parenting
- Getting Treatment for Trauma
- Self Love
- Medicine
- Physical Movement
- Going to 12 Step Recovery
- Feeling Accountable





*Dr. Potee joins the Home Podcast to talk about addiction and stigma*

HIPSOBRIETY.COM



*Dr. Potee on the impact of the opioid crisis upon children*

BOSTON GLOBE; MICHAEL LEVENSON



*CNN's Anthony Bourdain discusses addiction with Dr. Potee*

CNN; ANTHONY BOURDAIN



*Dr. Potee on opioid addiction among high school*



*Dr. Potee speaks with The Boston Globe about the lack of medication assisted treatment*

BOSTON GLOBE; KAREN D. BROWN

